

The *Camellia* Journal



'CHARLES ZERKOWSKY'

ACS Reg. No. 1919

Big as a *Reticulata*! But with more substance and texture! This is a chance *C. japonica* seedling of Ferol and Sam Zerkowsky of Tammia Nursery, Slidell, Louisiana. Blooms 6½ inches by 5 inches high with regular Gib-no telling how large when treated by Experts! This soft medium pink semidouble to peony is flecked with white and stands tall on display. Mid-season with abundant flowers November through February. Good upright bushy grower. Won Best Seedling Award Mobile, Alabama Show January 15, 1983. Propagated by Tammia Nursery. Available Fall 1983.

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AUGUST, 1983

SPECIAL ISSUE — PESTS AND DISEASES



BOEHM
IVORY-BILLED WOODPECKER



BOEHM
EAGLE OF FREEDOM I



BOEHM
BARN OWL



BOEHM
CEDAR WAXWINGS

New Birds "Come Home" to Roost

MILTON H. BROWN

Several "new" birds have recently come to roost at historic Massee Lane. It is not ornithologists who brought them here, but two very generous gentlemen in New Jersey. The Ivory-billed Woodpeckers and the Eagle of Freedom I were generously donated by Dr. Alvin Mancusi-Ungaro of West Orange, New Jersey. The Barn Owl and the rare pair of Cedar Waxwings on white bases were the generous gifts of Mr. Gordon Freesman of Englewood Cliffs, New Jersey.

The Society's good friend, Ray Blackman of the fabulous Brielle Galleries in Brielle, New Jersey, had talked to these gentlemen and graciously acted as the Society's agent in accepting these for the Society last November and December. They were cautiously and successfully moved to Massee Lane on April 24th.

IVORY-BILLED WOODPECKERS

(*Campephilus principalis*)

The Ivory-Billed Woodpeckers have been described by Reese Palley in his definitive book *The Porcelain Art of Edward Marshall Boehm* as "Undoubtedly the most magnificent, the most intricate and the most technically difficult of all the Boehm subjects up to its introduction and still the most exciting." Only four were produced in all between 1964 and March 1966. The one here at Massee Lane is the only one that is always on display free of charge to the public. One is at Bellingrath Gardens; one is at Syracuse University and the other is in private hands somewhere. Palley says that the Ivory-billed Woodpeckers was an enormous undertaking. "It tied up Ed Boehm, the studio, the sculptors and the decorators for over six months and it cost no one knows how much." He adds that "Ed Boehm in one of his moods and in spite of the enormous size (almost 5 feet high without the base) and its incredible complexity insisted that the piece would be produced and would be finished. It is interesting that the Ivory-billed was also one of those birds that was nearing extinction and this probably was one of the factors driving Ed to do this piece."

Indeed, our research on the Ivory-billed Woodpeckers is that it is virtually extinct. The last authenticated sighting was in 1952 although there were unconfirmed reports in 1963 and 1966. It can be said that the "civilized white man" is not entirely responsible for the extinction of this native American bird. The famous Naturalist, Mark Catesby, more than 200 years ago in his *Natural History of Carolinas, Florida and the Bahama Islands*, published in 1731, wrote "The bills of these Birds are much valued by the Canada Indians, who made Coronets of 'em for their Princes and great warriors . . . the Northern Indians having none of these Birds in their cold country, purchased them of the southern people at the price of two, and sometimes three, Buck-skins a bill." Nearly 100 years later Alexander Warren also said that the head and bill of the

bird was in great esteem among the Southern Indians who sold them as amulets or charms as well as ornaments, and, it is said, disposed of them to the northern tribes at considerable prices."

Another writer, Arthur T. Wayne, wrote in 1893 that "They are shot for food and the people — the crackers — consider them better than ducks! The bill is also prized and many fall victims for that reason."

It is fitting that this masterful creation by Mr. Boehm of the Ivory-billed Woodpeckers should rest here at Massee Lane as one of the last two sightings is generally thought to be the Okefenokee Swamp nearby in Georgia; the other was in what was known as the Singer Tract in Louisiana.

EAGLE OF FREEDOM I (*Haliaeetus leucocephalus*)

The Eagle of Freedom I is a full life-sized eagle. Its magnificent measurements are from beak to tail, 32"; across the wings, 24"; height 28"; diameter of base, 20"; weight some 90 pounds. It was the importance of the Bicentennial Celebration that seemed to demand an artistic contribution in sculpture that would appropriately symbolize the strength of our 200-year-old nation. The Boehm artists and craftsmen set for themselves the challenge of creating the American Bald Eagle in life-size — a *tour de force* in porcelain art. After ten months of effort of 178 intricate hand-molded parts, there emerged successfully one of the greatest high-fired porcelain sculptures ever created.

The limited edition to be offered to the public was set at thirteen in honor of the original American colonies. A 14th was presented to President Gerald Ford for the White House Bicentennial Celebration on the eve of Independence Day, 1976. The 15th and final sculpture continues on exhibition tour throughout the country. We are most fortunate to have sculpture #3.

Unlike the Ivory-billed Woodpecker which is probably extinct, the great American Bald Eagle population is "soaring again." This is good news as this bird is, indeed, our national bird and everything that can be done to increase the number of American Bald Eagles is to be highly commended.

BARN OWL (*Tyto alba pratincola*)

Also roosting at Massee Lane is the Barn Owl which is another life-sized piece some 27" wide x 21" high. It was created in the Boehm Studio in England in 1972 and was limited to 350.

The Barn Owl is another native bird of America and is sometimes referred to as the monkey-faced owl or the steeple owl. It roosts by day and searches for its prey at night. It is an interesting member of the owl family in that it does not have tufted ears. Like the other birds mentioned above, the barn owl, as all owls, is protected by law.

The Boehm Barn Owl is very realistic as he is gliding to a landing. A loose, fluffy feather "lands" on the wood on which the owl is lighting.

CEDAR WAXWINGS (*Bombcilla cedrorum*)

The movements of the Cedar Waxwings which are native to America are very unpredictable. They may visit almost any state at any time of the year. They usually travel in small flocks and rove the country in search of gardens and parks where they can eat the berries of the cedar trees and berries of European mountain ash and pyracantha. We find them also completely stripping the holly trees of their berries in the garden at Massee Lane.

Boehm initially announced that they would have a limited edition of 100 pieces of the Cedar Waxwings on Wild Blackberry. Most of the pieces seem to have a dark, almost blackish-brown base where this pair seem to be more rare in that they are each sitting on undecorated bisque bases. Reese Palley, actually, feels that 100 pairs were not actually made.



Seen here accepting the Eagle of Freedom I are J. Willard ("Bill") Marriott, Honor America Chairman, Mrs. Helen Boehm and President Jerry Ford. Mrs. Boehm presented this porcelain eagle to President Ford for the White House Bicentennial Collection. The presentation was made on the eve of Independence Day, 1976 at the White House. (Photo by Stan Jennings, Washington, DC; courtesy of Mrs. Helen Boehm.)

CONCLUSION

All of us in the American Camellia Society owe a deep debt of gratitude to these gentlemen for their contributions to the American Camellia Society. The Ivory-billed Woodpeckers and the Eagle of Freedom are on the library table. We have installed flood lights that light them up. They make a tremendous impact on people as they visit historic Massee Lane. We do plan gradually to get proper cabinets or cases for each of these two pieces.

The Barn Owl and the Cedar Waxwings are in the lovely Charleston-style vitrine cabinet in the reception room of the headquarters building. This cabinet is now lighted and displays these birds beautifully also.

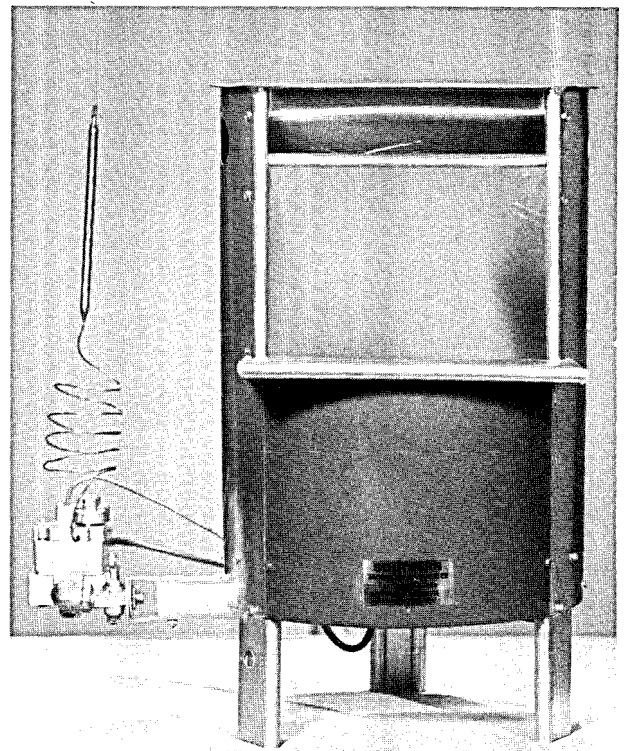
It is our hope one day to have another building in which we can display our growing collection of Boehm porcelains and

also to display our very rare books and original paintings of camellias that are now kept in the vault. We are dreamers, perhaps; but dreams only come true for those who dream them.

To honor the birthday of our country and this lovely new collection of Boehm porcelain, we had an open house at Massee Lane on July 3rd and had coverage in the local and nearby media. Many attended this patriotic and meaningful event.

The thousands of people who pass through Massee Lane annually now have even another gem to add to the beauty here as they also admire the Stevens-Taylor Porcelain Gallery of some 150 early pieces of the Boehm Studios.

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The *Camellia* Journal

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Volume 38

Number 3

August, 1983

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OF THE

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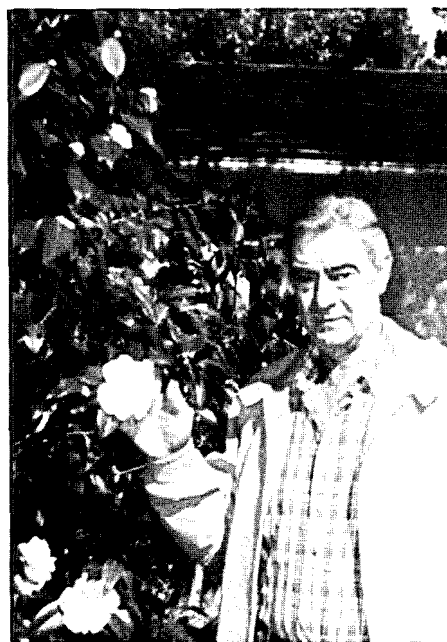
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President's Message



JACK L. MANDARICH

As I write this Message on this warm and beautiful day in June, it is hard to realize that another Camellia season is on the way. The new growth is hardening off and it's almost time to start disbudding. As you examine your plants, you wish and hope you have made all of the right moves in Camellia Culture and that you have grafted the best of the new ones.

As all of the hybridists know, the controlled cross pollinizing was very difficult this past season. The seed set was very sparse, the reason being the vast amount of rain we have had. One has to take preventive measures and make frequent trips to the garden to make sure the squirrels and birds don't run or fly off with the Mouchang, Jean Pursel crosses.

Your Directors are working hard to keep your Society financially strong, striving at all times to further the interest in Camellias and with a limited budget, has not cut down the size and number of your publications. As in every organization, regardless of kind and size, the most important phase is more memberships, because more memberships mean more finances for your Society's endeavors,

which means you will get more for your membership dues.

Should each of you secure only one new member for the coming year, most of our problems would be overcome and most of our goals could be reached. So I would like to make this appeal to the membership to strive for the coming year to take on this obligation and when in the near future we meet and greet each other, I would like to hear you say to me, "I got one." I realize the above statement is repetitious, *but I like to stress and remind you that A.C.S. is your organization.*

My personal thanks to the Governing Board and all of you outside the Board, who have accepted the Committee Assignments.

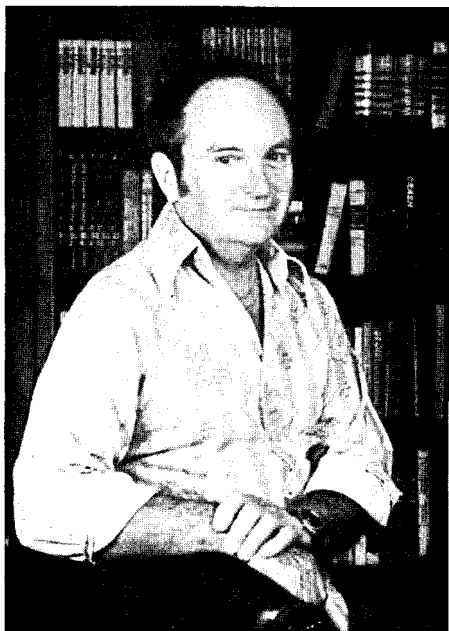
October 27-30th are the dates for the 34th Annual Fall meeting of the American Camellia Society, to be held in Chadds Ford, Kennett Square, Pa. I extend a special invitation to each of you to join with us.

Jack L. Mandarich
—ACS—

Gibbing is now!



From The Guest Editor



E. C. ("GENE") SNOOKS
La Jolla, California

In spite of all of these and still more diseases and insects you will learn about in this special issue, it is true that the camellia is relatively free of disease and insect pests. It was not without some fear and trepidation that these subjects were even considered for this issue. It is my firm belief that only when we are fully aware of and able to diagnose the ills which may afflict our plants that we are fully able to cope with them. It may be of further comfort to know that most of the insects and diseases covered here will never be observed by most growers. Furthermore, we have attempted to bring you "up to the moment" as concerns research into the various fields of control.

This special issue is dedicated to the countless gardeners whose observations have made us aware of the problems and to the dedicated scientists who have sought to control them. May the spirit of co-operation continue to exist until the victory is ours.

There is an old saying that states "Nothing is free" and how true it is. Nothing . . . be it material items, health, love or even death. So, too, it is with our

camellia hobby. To be sure there are plants to be bought, fertilizers, water, Winter care in some areas and related expenses but these are really quite small or can be made so. More dear in real cost is the loss of "an old friend" which has fallen victim to dieback, a promising seedling which is struck down by phytophthora or a prize specimen which has been distorted by scale or aphid infestation. Of even more noticeable consequence are the beautiful blooms which become infected with petal blight and turn an ugly brown.

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Antropod Pests of Camellia Spp.

INTRODUCTION

Camellias thrive best under subtropical conditions with moderate temperatures and high humidity. For this reason the southern region of the United States was the first popular area for this evergreen shrub. As the western United States was settled, it was found that the Pacific coast states possessed a climate ideally suited to growing camellias. In addition, some hardier varieties can be grown as far north as New York and Pennsylvania, if planted in sheltered locations.

Camellias grown in each of these areas will have its own complex of arthropod pests — some of which will be more severe in particular locations. The purpose of this article is to review the biology and control of the major camellia pests. Unfortunately, very little entomological research has been done recently on these pests, so what is reported is a compilation of data extracted from classic publications on pests of woody nursery plantings. Much of the biological information reported in these earlier papers is timeless; however, the pesticide recommendations are outdated. Therefore, some of the current pesticide recommendations for 1983 in California are given. Not all the registered pesticides are listed; these will vary from state to state. In addition, rates and formulations of pesticides are not provided. It is best to check the pesticide recommendations in your state before making any applications. Finally, phytotoxicity may be a problem, especially with some of the newer insecticides. If you have never used a material, a particular formulation or rate, it is best to try it out on a few plants prior to widespread application.

SCALE INSECTS

Damage caused by scale insects is usually serious, especially when their presence is not recognized until the population is heavy and advanced symptoms of injury begin to show. If treatment is neglected, it may be difficult to prevent the loss of part or all of the plant.

Scale insects are so different from the usual concept of insects that they are often mistaken for fungal growths. They have sucking mouthparts and feed on plant juices. Generally, scales are quite small and can become so numerous that they literally coat the leaves and stems. Heavily infested plants appear unhealthy and produce very little new growth. The foliage develops chlorotic areas and may drop, and portions of twigs or branches may die. Scale insects are primarily disseminated through the movement of infested nursery stock, although in some instances they may be carried from infested plants by birds or other animals. These insects are divided into 2 groups: armored scales and soft scales.

ARMORED SCALES

Although many kinds of armored scales attack camellia, they are similar in habits and life history. These insects secrete a waxy, hardened, protective covering which is not an integral part of the insect's body. This protective covering, under which the

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insect lives and feeds, is called the scale or armor, hence the common name. The tiny scale may be circular, semi-circular, oblong or pear-shaped. Adult females vary from about 1/12 to 1/8 inch in diameter or length. The adult males are tiny, two-winged gnatlike insects, and are seldom observed. The sexes of young scales cannot be distinguished but this is easily done with older immatures. As a general rule, the late immature stage of the male is similar to the female but much smaller. There are a few exceptions, as in the tea scale (discussed below) where the males, because of their white color, are more conspicuous than the females.

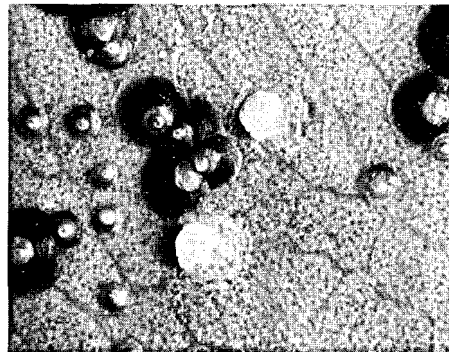


FIGURE 1. Florida Red Scale — *Chrysomphalus aonidum*. Note scale covering removed revealing the body of the insect.



FIGURE 2. Greedy Scale — *Hemiberlesia rapax*.

Florida Red Scale — *Chrysomphalus aonidum* (L.)

The shield of the female scale is thin, circular flat with a central nipple and a dark mahogany red color (Fig. 1). The shield of the male scale is smaller, more or less oval and somewhat lighter in color. The shield can be easily removed from the scale with a needle; this exposes the light yellow body of the insect which is firmly attached to the plant (Fig. 1). Florida red scale attacks only leaves. The life cycle of *C. aonidum* will serve as a generalized life cycle for all the armored scales attacking camellia. The female deposits eggs under the scale covering. As many as 300 eggs may be laid which, depending on

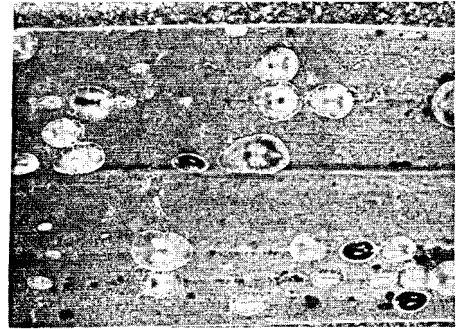


FIGURE 3. Brown Soft Scale — *Coccus hesperidum*. Black scales are parasitized.

temperature, hatch in 1-2 weeks. The newly hatched scale, known as a crawler, is broadly oval in shape, flattened and bright yellow in color. As the name implies, this stage has the ability to crawl and move freely about. The crawler moves out over the plant to the succulent new growth, selects a place to settle, inserts its mouthparts into the plant tissue and, in the case of the female, remains there for the rest of its life. Insecticides are very effective against the crawlers and timing applications to coincide with this stage will maximize control. Check with your county extension specialist for periods of crawler activity in your area. The adult stage is reached in 5-11 weeks and there are usually several overlapping generations each year.

Tea Scale — *Fiorintia theae* Green

The tea scale is hard and elongate, approximately 1/25 inch long. Young scales are yellow in color which later turn dark brown. *F. theae* is commonly found on twigs and leaf surfaces and is one of the most destructive scale pests of camellia.

Oyster shell scale — *Lepidosaphes ulmi* (L.)

The common name of this insect is very well chosen as the shells of this scale look very much like a miniature oyster. The scale cover is 1/8 inch long and is ash gray to blackish. When the scale covering is removed the body of the female appears yellowish white.

Camellia scale — *Lepidosaphes camelliae* Hoke

The camellia scale looks very much like the common oystershell scale except for the tannish brown scale covering. This species is probably unable to overwinter in the more northerly areas where camellias are grown.

Greedy scale — *Hemiberlesia rapax* (Comstock)

The female greedy scale is more or less circular, strongly convex and whitish in color with the apex of the scale covering off to one side (Fig. 2). This species chiefly infests the stems as well as the axils of the leaves and bases of the buds.

Other armored scales that have been found infesting camellia include: chaff scale — *Parlatoria pergandii* (Comstock), olive scale — *Parlatoria oleae* (Colvée), glover scale — *Lepidosaphes gloveri* (Packard), California red scale —

Aonidiella aurantii (Maskell), latania scale — *Hemiberlesia lataniae* (Signoret), oleander scale (also called ivy scale) — *Aspidiotus nerii* (Bouché), dictyospermum scale — *Chrysomphalus dictyospermi* (Morgan), euonymus scale — *Unaspis euonymi* (Comstock), peony scale — *Pseudoanida paenoniae*, a palm fiorinia — *Fiorinia fioriniae* (Targ.), and *Lindingaspis rossi* (Maskell) which has no common name.

SOFT SCALES

In the soft scales, unlike the armored scales, the waxy secretion that comprises the scale is an integral part of the insect's body. Some of these scales are covered with a waxy, cottony material while others are naked. Soft scales vary considerably in size and shape; some are flat or slightly convex while others are almost spherical. They are larger than the armored scales and vary from 1/12 to 1/3 inch in length. Usually the eggs are laid underneath the female and hatch in 1-3 weeks. The number of eggs per female ranges from 100-1000. Some soft scales give birth to living young. The newly hatched scales, called crawlers, move about over the plant for a few days to several weeks before settling down to feed. Development is slow and periods of several months to almost a year may elapse before the female becomes an adult.

Brown soft scale — *Coccus hesperidum* L.

The brown soft scale, or tortoise scale as it is sometimes called, is flat and fleshy with an oval outline (Fig. 3). The color is usually light brown to greenish brown and often blends in with the color of the foliage on which it occurs. The shape of this scale varies according to the scale's attachment to the host plant. Although plants are seldom killed by brown soft scales, the honeydew these insects secrete allows dark fungi (sooty molds) to grow on the host. Sooty mold greatly detracts from the beauty of infested plants.

C. hesperidum is an example of a soft scale which gives birth to living young. More specifically, eggs are retained within the female and the young scales hatch from the eggs as they are laid. The female raises herself above the leaf surface allowing the young nymphs to escape. Mobile for several days, they insert their mouthparts into the plant and exhibit a preference for shady areas and for young branches and leaves. After attachment to the plant, they molt in about 1 week and the cast skins (exuviae) look like dust. The second nymphal stage lasts about 3 weeks and adult females live 2-3 months. Male scales, which are rare, live only a few days. When present, immature male scales are readily distinguished from females due to their elongated shape and white color; the latter aspect allows for them to be seen readily on the part of the plant on which they are resting.

Many natural enemies of the brown soft scale may limit population growth (Fig. 4). These scales are often guarded by ants which collect the honeydew excreted. The brown soft scale has been found overwintering as a nymph as far north as Virginia.

Hemispherical scale — *Saissetia coffeae* (Walker)

As the name implies, this scale is regularly hemispherical, brown, smooth and shiny (Fig. 5). On the



FIGURE 4. *Coccophagus* sp. — a parasite of brown soft scale.

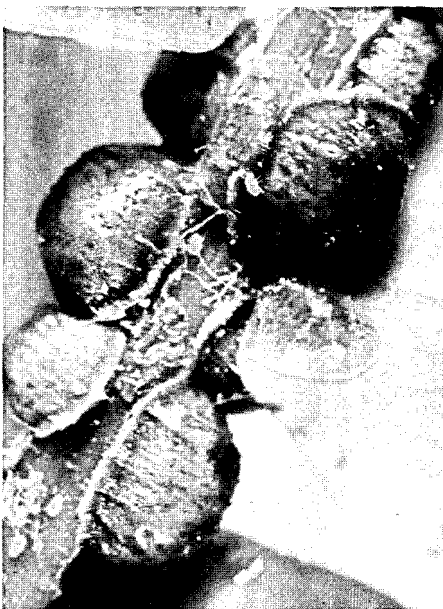


FIGURE 5. Hemispherical Scale — *Saissetia coffeae*.

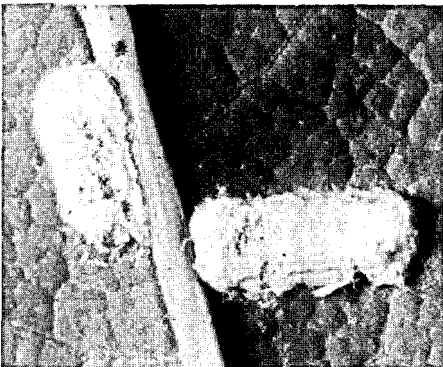


FIGURE 6. Cottony camellia scale — *Pulvinaria floccifera*.

dorsal surface, the scale has a pattern of ridges in the form of the letter "H." Depending on the host on which it is feeding, the adult scale will vary in size from 1/10 - 1/4 inch. Like the brown soft scale, *coffeae* produces large amounts of honeydew which promotes the growth of sooty mold and attracts ants. Each female produces about 1,000 eggs after which the female dies and her body shrinks to form a cup around the eggs. For this reason, hemispherical scales are relatively difficult to control

with insecticides; eggs and young nymphs are protected by the body of the mother. In addition, there are few effective natural enemies of this species.

Cottony camellia scale* — *Pulvinaria floccifera* (Westwood)

The body of the cottony camellia scale is oval and flattened and resembles that of the brown soft scale. However, these species produce a cottony white egg sac, and when developing, this can be used to separate *P. floccifera* from the brown soft scale (Fig. 6). This pure white egg sac is about 2-3 times the length of the body of the scale and the overall length of the scale with the egg sac may be 1/4 inch. The immature forms are flattened, brown to yellowish green in color and oval in outline. This scale overwinters on the bark of its host in a partially grown condition and resumes development as temperatures warm during spring. The egg sac may contain as high as 3,000 eggs. Upon hatching, young scales migrate to the leaves and are usually found on the underside, along the midrib. *P. floccifera* has numerous natural enemies and these prevent many of the young scales from reaching maturity. There is one generation per year.

Other species of soft scales found attacking camellia include: black scale — *Saissetia oleae* (Olivier), and the Japanese wax scale — *Ceroplastes ceriferus* (F.).

CONTROL OF SCALE INSECTS

Oils

Petroleum oils that are used for spraying are derived from certain distillation fractions which are refined by removing most of the portion which reacts with sulfuric acid. Oils which are less phytotoxic to foliage contain a higher percentage of this unsulfonated residue. This usually ranges from 90-98% in the "light oils" or "foliage oils." The less volatile and more viscous oils (medium and heavy oils) are more effective as insecticides; however, they are also more phytotoxic.

Oils should be used at 1 to 1.2 percent dilutions (4 to 6 quarts per 100 gallons or 3 to 5 tablespoons per gallon). The concentration used is dependent on the type of plant to be treated, the severity of the insect infestation and the time of the year the application is made. In general, the higher concentrations can be used on camellia; most woody ornamentals are tolerant of higher concentrations. The spray should be applied with considerable force and it is important to cover the underside of the leaves. Applications are usually made in the fall prior to blooming (dormant spray) in an effort to smother overwintering scales or in the spring after blooming. Spring-time applications should be timed to coincide with crawler activity. As stated previously, this greatly improves scale mortality. As a general rule, no more than 3 applications should be made per year, with at least 60 days between sprays. Light oils are compatible with other insecticides and, when mixed, the concentration of oil can be dramatically reduced. Check with your county extension agent for specific recommendations. Ortho Volck® oil spray is just one of many light oils available commercially.

* The common name of this species is not recognized by the Entomological Society of America.

Insecticides^b registered for use include acephate (Orthene®), diazinon, dimethoate (Cygon®), carbaryl (Sevin®), and malathion. Acephate and dimethoate are systematic insecticides, effective for as long as 3 weeks after application. For specific recommendations in your area, consult with the county extension office. In a study completed in 1982, Dr. Peter B. Schultz¹ evaluated several insecticides for control of the cottony camellia scale, *P. floccifera*. Among those tested against the crawler stage were Orthene 75SP (0.67 lbs ai/100 gal H₂O) and Sevin XLR (1.0 lb ai/100 gal H₂O). Dr. Schultz found that the Sevin XLR provided the best crawler control.

Natural Control of Scales

Growers should be alert for scales with small holes chewed in their covers and for tiny parasitic wasps (Fig. 4). When present, the use of pesticides may not be needed. The decision to spray or not to spray is difficult to make; experience is the best teacher.



FIGURE 7. Citrus mealybug *Planococcus citri* (with egg mass).

ments. Male mealybugs have greatly reduced mouthparts and do not feed. Identification of mealybugs is based upon mature females, since males are so rarely available.

Females lay masses of several hundred yellowish or orange eggs in white, cottony ovisacs (cocoons) or they give birth to living young. Egg laying normally extends over a period of about 10 days and these hatch in approximately two weeks. Young females reach maturity in six to eight weeks. Males form a cottony cocoon approximately two to three weeks after emerging from the egg stage where they transform into a delicate, winged reproductive male. All stages (eggs, nymphs, adults) are normally found on a plant due to overlapping generations. The time periods discussed above are generalizations made at warm greenhouse temperatures. Development will be slower at temperatures normally found at outdoor locations.

The masses of wax produced by mealybugs and their conspicuous cottony egg sacs greatly reduce the aesthetic quality of the plant. Mealybugs excrete copious amounts of honeydew which cause

America and it survives out-of-doors in the southern states and southern California.

Long-tailed mealybug, *Pseudococcus longispinus* (Targioni-Tozzetti)

The long-tailed mealybug has the body thinly covered with white wax with a broad, faint stripe down the middle. Filaments along the sides are often one-half the width of the body. The terminal ones are as long as the body or longer from which the insect's common name is derived (Fig. 8). The long-tailed mealybug lays no eggs; living young are produced. Long-tailed mealybugs are not as difficult to control as other mealybugs because there is no egg stage protected by a dense ovisac. This species is widespread throughout the world, occurring mainly in greenhouses in northern latitudes. It is found out-of-doors in the warmer parts of North America, such as Florida, Mexico, Texas and southern California.

The obscure mealybug, *Pseudococcus obcurus* (Essig), has also been found to attack camellia.

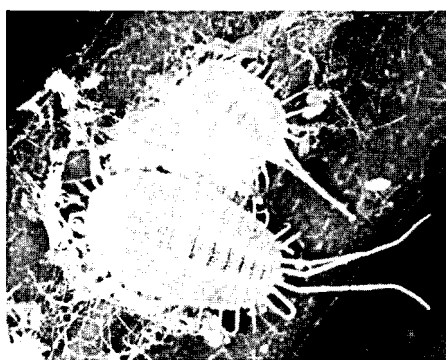


FIGURE 8. Longtailed mealybug, *Pseudococcus longispinus*.



FIGURE 9. Mealybug destroyer *Cryptolaemus* sp. (feeding on aphids).

MEALYBUGS

Mealybugs are slow moving arthropods which, in the female stage, are soft insects with distinct segmentation. They are oval and somewhat elongated and are usually covered, in varying thicknesses, with a mealy or cottony waxy secretion from which their common name is derived. These secretions often extend into a series of short filaments along the sides of the body and into two longer filaments at the posterior end of the body. The mouthparts are threadlike, often longer than the body itself and can be inserted into tough tissue and even through bark to suck juices from the host plant. There are over 300 species worldwide and they vary in size from very minute young, 1/50 to mature adult females measuring as much as 1/3 inch. Young, immature mealybugs (nymphs) are extremely active, mobile insects and are referred to as crawlers. They are tiny, rounded and yellowish in color with reddish eyes and distinct antennae. The males are extremely shortlived and consequently are rarely seen. They are very delicate, usually winged insects possessing two, conspicuous long, caudal wax fila-

the leaves below the mealybugs to become shiny and sticky. This serves as a medium for the growth of soot mold and traps dust and dirt; the result is an unsightly plant. Feeding by mealybugs often caused distorted growth and premature leaf drop. The mass of wax covering their body and eggs poses problems for control with insecticides by making thorough coverage very difficult. In addition, light infestations are easily overlooked because mealybugs often wedge themselves into small crevices on the host plant. There are two important species of mealybugs which attack camellia. These species are discussed below.

Pest Species

Citrus mealybug, *Planococcus citri* (Risso)

The citrus mealybug is heavily and evenly covered with white powdery wax except for a faint, narrow streak down the middle (Fig. 7). Short waxy filaments are present on the sides, the rear ones being approximately one-fourth the length of the body. This species lays irregular cottony egg masses which contain as many as 500 eggs. The citrus mealybug is common in greenhouses all over North

CHEMICAL CONTROL OF MEALYBUGS

As discussed under "Scales," light oils can be used effectively against mealybugs. A strong surge of ordinary water is effective in dislodging adults and breaking up egg sacs. Insecticides registered for mealybug control include: acephate (Orthene), diazinon, dimethoate (Cygon), and malathion. See your county extension office for specific recommendations.

BIOLOGICAL CONTROL OF MEALYBUGS

The mealybug destroyer, *Cryptolaemus montrouzieri* (Mulsant), can be a very effective control for many species of mealybugs affecting above-ground parts of plants (Fig. 9). This species bears a striking resemblance to immature mealybugs, and has the capability to feed on other pests. This predaceous ladybird beetle is a native of Australia and was first brought into California in 1892 for the control of citrus mealybugs in citrus groves. Subsequently, the mealybug destroyer has been released in many areas of the U.S. and in 35 different countries. When releases were made in climatically favorable areas for the predator, the mealybug destroyer thrived. In other less favorable areas, the predator did not do as well and more mealybug

^b Common names are followed by trade names in parentheses.

¹ Virginia Truck and Ornamentals Research Station, 1444 Diamond Springs Road, Virginia Beach, VA 23455.

destroyers had to be released. In response to the large demand for predators by growers, hundreds of thousands of these beetles were raised in private commercial insectaries to supplement field populations. This practice continues today in California, with 6 commercial insectaries producing *C. montrouzieri* (Table 1).

MITES

SPIDER MITES

Spider mites, or red spiders, as they are commonly called, are among the most serious pests of ornamental plants. Because of their very small size and the general habit of feeding on the undersurface of leaves, their presence often escapes detection until they are exceedingly numerous and plant damage is obvious. The needlelike mouthparts are used to puncture the tissues, and a speckled appearance of the leaves and flowers usually results. In severe infestations, entire leaves may become bleached and curled, and leaf drop occurs.

Spider mites are soft bodied, more or less elliptical, with the back arched and bearing bristles. The adult female is less than 1/50 inch in length. They are colored greenish, yellowish or reddish, and often have dark spots on each side (Fig. 10). The eggs are globular or flattened above and are pearly, amber or red in color. Eggs are laid singly on leaves. Adult females may lay several or more eggs per day, producing as high as 50-100 eggs. During the course of development three resting stages occur, each prior to shedding the skin.

Three species of spider mites are reported to attack camellia: southern red mite, *Oligonychus ilicis* (McGregor), the tea red spider mite, *O. coffeae* (Nietner), and the twospotted spider mite, *Tetranychus urticae* (Koch). Southern red mite is the most common and is discussed below.



FIGURE 10. Twospotted spider mite — *Tetranychus urticae* (with eggs).



FIGURE 11. Typical bud or rust mites.

TABLE 1
Insectaries that commercially produce *Cryptolaemus montrouzieri* (Mulsant), the mealybug destroyer.*

Name	Location	Phone
Associates Insectary	P. O. Box 969 Santa Paula, CA 93060	(805) 525-7015 933-1301
Bio Insect Control	1710 S. Broadway Plainview, TX 79072	(806) 293-5861
Foothill Ag. Res., Inc.	510 W. Chase Drive Corona, CA 91720	(714) 371-0120
King's Natural Pest Control	224 Yost Avenue Spring City, PA 19475	no phone listed
Natural Pest Controls	9397 Premier Way Sacramento, CA 95826	(916) 362-2660
Peaceful Valley Farms	11173 Peaceful Valley Rd. Nevada City, CA 95959	(916) 265-3339
Rincon-Vitova Insectaries, Inc.	P. O. Box 95 Oak View, CA 93022	(805) 643-5407
Spalding Laboratories	760 Printz Rd. Arroyo Grande, CA 95207	(209) 948-4231

* Condensed from *Suppliers of Beneficial Organisms in North America*, State of California, Dept. of Food and Agriculture. One copy is available free from Biological Control Services Program, 3288 Meadowview Rd., Sacramento, CA 95832 (916) 445-6214.

Southern red mite (SRM) — *Oligonychus ilicis* (McGregor)

The southern red mite develops best in cool weather; reproduction and feeding occur primarily in spring and fall. The converse is true for many other species of spider mites which prefer hot, dry weather. Injury caused by SRM usually appears during the first hot days of summer; the actual damage occurred earlier. SRM females are basically purplish or reddish, pale anteriorly with a pale spot medially. These mites feed almost exclusively on the top sides of camellia leaves causing a bronzing and a browning along the mid-rib of the upper leaf surface. Leaf infestations are often localized along the mid-rib; other portions of the leaf usually have few mites and relatively little damage. Feeding by this mite produces less toxic effects to its hosts than many other economic mite pests because heavy infestations can be tolerated before leaf drop occurs.

Females deposit 10-15 eggs and these complete development in two weeks with temperatures in the low- to mid-70s. Egg laying lasts for 3 days and adults live for approximately 15 days. In Massachusetts, overwintering eggs hatch in late April and early May with populations peaking in June; at this time migration to new growth occurs. Populations generally decline in late June and July followed by an increase in September resulting in the deposition of large numbers of overwintering eggs.

CONTROL

PESTICIDES

A single spray of residual acaricide in mid-May usually prevents severe injury. Acaricides such as fenbutatin-oxide (Vendex®), docofol (Kelthane®), etc. should provide effective control. Please check with your county agricultural office for specific recommendations. In a recent study (1982) conducted by Dr. Schultz in Virginia, evaluations of Vendex 50W (0.5 lb ai/100 gal), Vendex 4L (0.25 lb ai/100 gal), Kelthane 1.6E (0.4 lb ai/100 gal), Pentac 4F (0.25 lb ai/100 gal), and Omite 30W (0.3 lb ai/100 gal) were made for control of SRM. All materials, except Omite, significantly reduced SRM numbers compared to the check.

NATURAL CONTROL

Natural enemies of mites are common and important, although they cannot always be relied upon to prevent injury to the host plant. A factor



FIGURE 12. Green peach aphid — *Myzus persicae* (winged female and nymphs).

that favors natural control is that SRM eggs remain dormant during the hot summer months — a time when many natural predators are active. Since most of these feed on all SRM stages, they may cause appreciable mortality which will slow down normal September population increases. Predaceous mites, ladybird beetles and thrips may all contribute to SRM mortality.

BUD AND RUST MITES

These mites are basically wormlike and from 1/250 to 1/80 inch long (Fig. 11). They are, for all practical purposes, invisible to the unaided eye. A microscope or at least a 20X hand lens is required to see them.

Camellia bud mite* — *Cosetacus camelliae* (K.)

This species occurs under scales of both vegetative and flower buds on camellia. Its presence has been linked to immature flower drop. In northern California, it is not detectable until early February, when flower buds with heavy infestations show brown edges on the bud scales. If left unchecked, the flower buds turn brown and drop before blooming. *C. camelliae* has been found feeding on the inner side of the bud scale and occasionally on developing flower petals. The camellia bud mite is whitish and wormlike. Little is known of its biology.

(ED. NOTE: See "Camellia Bud Mite," p. 12.)

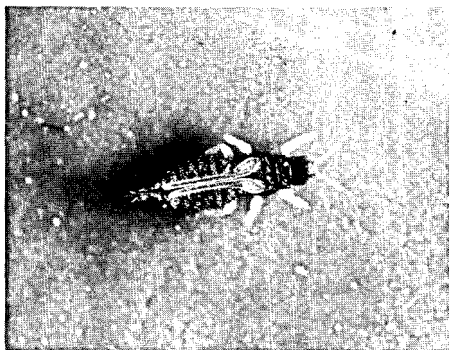


FIGURE 13. Greenhouse thrips — *Heliothrips haemorrhoidalis* (adult).

Camellia rust mites* — *Acaphylla steinwedeni* K. and *Calacarus carinatus* (Green)

A. steinwedeni is an orange-colored mite that lives mostly on the underside of camellia leaves. So far, this species has been found only on camellia in California, Alabama and Florida. It causes considerable leaf russeting, especially in more protected places where humidity is high. Little is known concerning the biology of *A. steinwedeni*. *C. carinatus* causes bronzing of the upper surface and downward folding of leaf edges. It deposits debris (in the form of cast skins) on the leaves which appears as white streaks. This species is a purplish color with distinctive waxy exudates forming ridges on its body. *C. carinatus* has been reported from California, Florida and Georgia.

CONTROL

Thorough spray coverage is essential to obtain good control of these mites. This is difficult to

accomplish with bud mites due to their preference for areas under vegetative and bud scales. Diazinon is often recommended for control. Check with your local county extension office for specific recommendations.

APHIDS

Aphids, or plant lice, are well known insects that infest nearly all types of plants. They are commonly found in colonies on the shoots of new growth, but they may also occur under leaves, on stems and on developing buds. They injure plants by sucking their juices with a long beak; new leaves are often curled and crinkled by this feeding. Aphids also excrete honeydew which may be produced in such quantity that it forms a glistening coating on lower leaves and branches. This honeydew attracts ants and promotes the growth of black sooty mold.

Aphids are soft-bodied, usually with long legs and antennae and usually possessing a pair of tubes near the end of the body which are called cornicles. Adults are generally from 1/12 to 1/8 inch in length and they are colored greenish, yellowish, pink, purplish, brown or black (Fig. 12). Most species have winged or wingless forms. The life cycle of aphids is often complicated, and various species may differ considerably in details of development. A single female may produce from 60 to 100 progeny before dying at an age of 20-30 days. The young may reach maturity in 6-7 days.



FIGURE 14. Flower thrips — *Frankliniella* sp. (adults).

Green peach aphid — *Myzus persicae* (Sulzer)

The wingless form of the green peach aphid is slender and greenish in color (Fig. 12). The winged form has a conspicuous, large dusk blotch on the body. The cornicles are long and slender and slightly swollen at the tip. Resistance to organophosphate insecticides has been reported for this aphid in various parts of the country.

The black citrus aphid, *Toxoptera aurantii* (Fonscolombe), has also been found to attack camellia.

NATURAL CONTROL

Aphids are attacked by a large complex of natural enemies including ladybird beetles, lacewing larvae, flower bugs and many species of parasites. Evidence of parasite activity can be detected by the presence of aphid mummies; brown, hollow aphids with small emergence holes somewhere on the body. A large complex of natural enemies may eliminate the need to spray.

CHEMICAL CONTROL

Aphids are often easy to kill, although repeated applications may be necessary to keep them under control. Growers should be on the lookout for phosphate-resistant aphids, which will be more difficult to kill. Materials often recommended for aphid control include: acephate (Orthene®), diazinon, dimethoate (Cygon®), oxydemeton-methyl (Metasystox-R®), and malathion. Check with your local county agricultural office for specific recommendations.

THRIPS

Thrips can be important pests of camellia, attacking primarily the buds and flowers; occasionally leaves may be damaged. They feed on plant tissues by puncturing the surface and then sucking the liberated juices. This may be accompanied by premature defoliation or else the flowers may be seriously blotched and streaked. The surfaces of tissues that thrips have penetrated deeply develop a silvery sheen, due to air occupying the emptied cell cavities. The silverying is emphasized by the lens-like effect of the epidermis above the shattered cells. Damaged mesophyll cells often turn greenish brown or yellow and where many thrips have fed, the discolored areas coalesce and whole leaves may dry and fall prematurely. Faeces are deposited at or near the feeding site as a small speck of colored material, surrounded by a larger volume of colorless, watery fluid. Brown fungi often grow on this as

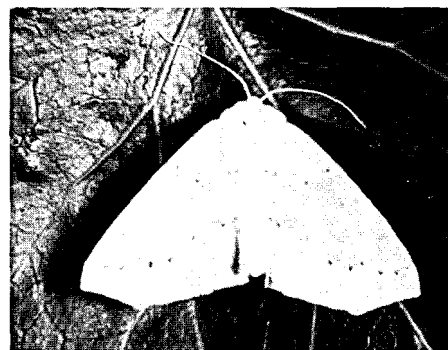


FIGURE 15. Omnivorous looper — *Sabulodes caberata* (adult).

it dries and when thrips are abundant this produces an unsightly discoloration.

Thrips are slender, very small insects ranging from 1/50-1/25 inch in length when full grown. Immature stages are usually whitish or yellowish with red eyes. Thrips sometimes run rapidly, and some are able to hop. Adults are usually able to fly, although the very slender, feather-like wings are easily overlooked as they are usually folded over the back. From two weeks to two months are required for the completion of a generation. Tiny, bean-shaped eggs are laid within the more tender plant tissues, each female laying 25 to 100 eggs. These hatch in 4-20 days and two larval stages follow which are completed in 7-20 days. Two resting stages occur (prepupa and pupal stage) and these are found where the larvae were feeding or in the soil at the base of the plant. These pupal stages require 4-14 days before adult thrips emerge.

Greenhouse thrips — *Heliothrips haemorrhoidalis* (Bouché)

The greenhouse thrips has a dark brown body with the back section much lighter in color (Fig. 13). The legs are a light yellow and the wings are a uniform dusky-clear except at the base. The front portion of the body is covered with a strong network of lines. This thrip feeds almost entirely on the foliage. Large colonies sometimes build up and cause serious damage.

Flower thrips — *Frankliniella* spp.

Flower thrips are tiny, yellowish species which enter the developing flowers of many species (Fig. 14). The blooms may be malformed or streaked due to their feeding. When outside flowers and weeds begin to dry up, migration of flower thrips occurs, and many species of ornamental plants become infested.

CONTROL

With eggs laid within plant tissue and the pupal stages of thrips sometimes occurring in the soil, the most satisfactory control of thrips is with an insecticide which possesses considerable residual action. Some excellent materials include acephate (Orthene®), dimethoate (Cygon®), and bendiocarb (Ficam®). Care should be made to avoid applications to open blooms. Check with your county agricultural office for specific recommendations.

LEPIDOPTERA

LOOPERS

Loopers, or measuring worms, are caterpillars which eat the leaves of camellia. They may be recognized by the series of looping movements which they make when moving. They frequently rest by holding out with the hind legs and straightening the body out. These worms are variously colored and about ¾ inch long when full grown. Adult moths have slender bodies and broad delicate wings (Fig. 15). These are held partly outstretched when at rest and are approximately 1 inch long. Eggs are usually laid in small clusters on the foliage. As the caterpillar grows, considerable amounts of foliage are consumed. They often fasten leaves together in which to hide during the day. The pupal stage may be passed in this sheltered location. There are usually several generations per year.

Omnivorous looper — *Sabulodes caberata* (Guenée)

This is the most common species found on camellia and is readily distinguished by the presence of narrow, green and black stripes on a yellowish or orange background (Fig. 16).

OTHER LEPIDOPTERA

Omnivorous leafroller*, *Platynota stultana* (Walsingham), the orange tortrix, *Argyrotaenia citrana* (Fernald) and various species of cutworms have been found to attack camellia.

CONTROL

Several materials provide effective control of these *Lepidoptera* including carbaryl (Sevin®), methoxychlor, *Bacillus thuringiensis* (Dipel®), acephate (Orthene®) and dimethoate (Cygon®). Check with your local county agriculture office for specific recommendations.

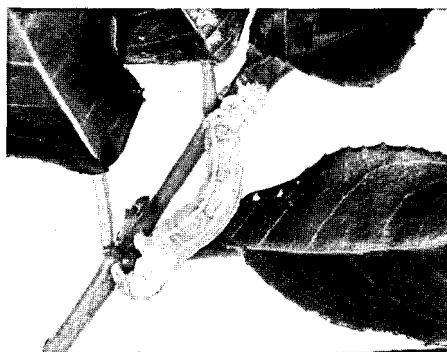


FIGURE 16. Omnivorous looper — *S. caberata* (larvae).



FIGURE 17. Black vine weevil — *Otiorynchus sulcatus* (larva and pupa).

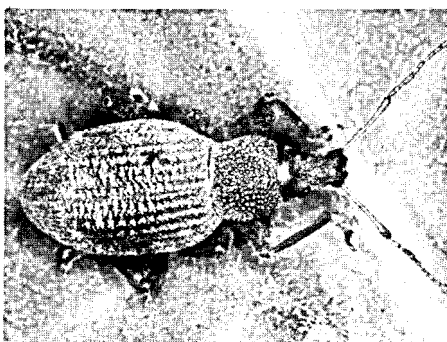


FIGURE 18. Black vine weevil — *O. sulcatus* (adult).

ROOT WEEVILS

Adult root weevils commonly chew on the foliage or flowers, causing distinctive notching. Heavy adult populations can cause severe notching. More damage is caused by the grubs (larvae) which feed throughout the root zone deep in the soil. Damage by grubs is most severe in potted nursery stock or in very sandy soil. As larvae become larger in late winter or early spring, they may girdle the crowns of smaller plants.

Larvae of all species of root weevils are very similar in appearance. They are legless, white grubs with brown heads, approximately 1/12 to 1/2 inch in length (Fig. 16). The pupa is about the same size as the adult and is white. It is very soft and has the outline of the parts of the adult weevil (Fig. 17). Winter is spent primarily as larvae in the soil. In late winter or early spring feeding activity resumes and extensive damage may occur. In late April to June, larvae change to pupae and adults emerge shortly thereafter. Adult weevils are hard-shelled insects

which have the front portion of the head prolonged to form a snout. They are dark in color, and are commonly 1/12 to 1/2 inch in length (Fig. 18). Adults feed on plant foliage and begin to lay approximately 500 eggs in the soil 20-30 days after emergence. Adults feed and lay eggs primarily at night and hide in dense stems or in debris at the base of the plant during the day. When disturbed, the adults quickly drop to the ground. Generally, many of these weevils are parthenogenetic; that is, no male is needed for successful reproduction. The adults cannot fly because the hard, shell-like forewings are fused together. As a result, several years may be required for them to spread entirely across a large planting from an outside source or from infested plants or soil brought into a clean planting.

Species of root weevils attacking camellia include: black vine weevil, *Otiorynchus sulcatus* (Fabricius), obscure root weevil, *Sciopithes obscurus* (Essig), woods weevil, *Nemocestes incomptus* (Horn), Fuller rose beetle, *Pantomorus cerinus* (Boheman), and the Japanese weevil*, *Callirhopalus bifasciatus* (Roelofs).

CONTROL

Control of root weevils with insecticides has proven to be difficult. Foliar sprays, directed against night-feeding adults appear to be the most effective. Insecticides currently recommended include: bendiocarb (Ficam®), acephate (Orthene®) and carbaryl (Sevin®). By spraying at night mortality is enhanced due to a combination of direct contact toxicity plus the mortality caused by ingestion of pesticide treated foliage. Application of insecticides to the soil appear to have limited success against larvae. Carbofuran (Furadan®) acephate (Orthene®) and bendiocarb (Ficam®) are registered for soil applications. For specific recommendations, contact your county extension office.

Very promising research is currently underway using the parasitic nematode, *Neoplectana carpocapsae* (Weiser), for control of larvae in soil. Initial research, under the direction of Dr. Harry Kaya (Assoc. Nematologist, Nematology, 475 Hutchison Hall, U. C. Davis, Davis, Calif. 95016) should be completed in 1983.

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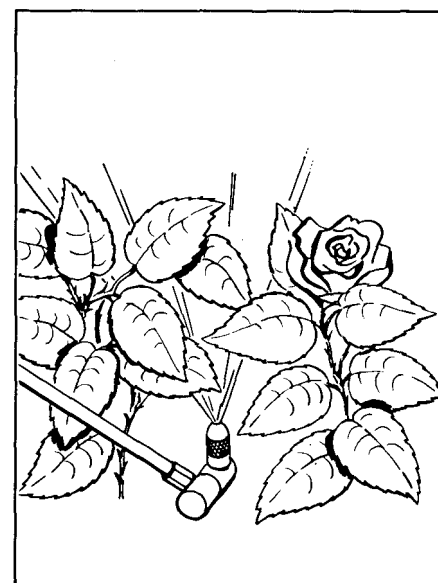
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spraying as soon as the spring growth has hardened off, the second as soon as the flower buds have become clearly recognizable with more attention given to the terminal flower buds and a third spraying about a month later. Care should be taken to avoid over-spray falling on soft-leaved plants such as maples as the oil damages the foliage; and to avoid spraying in hot and sunny weather (not in the full sun).°

The purpose of this spray program is to prevent the mite getting into the flower buds. Once there, they are hard to get at and even strong organic phosphate insecticides seem to have little effect.

Another group of insecticides that are quite effective are the elemental sulphur releasing chemicals such as lime-sulphur and wettable sulphur. These must never be mixed with other chemicals particularly never with an oil spray. We use lime-sulphur on occasions as a change of diet for the mite in case they become tolerant to the 'Kelthane'° type of miticide.

The bud mites are very common on *Camellia japonica*, the *C. hiemalis*, the *Williamsii* hybrids, *reticulata* hybrids and rarely on the *sasanquas* and *vernalis*. As the *hiemalis*, *Williamsii*, *reticulatas* and some species suffer badly when attacked by the leaf mites, mainly *Calacarus adornatus* (Keiffer) which causes a browning or reddishness on the leaves, these are included in the spraying program.



An adjustable nozzle lets you mist under the leaves where scale and other "bugs" "settle in." (Photo courtesy of H. D. Hudson Co.)

Camellia Bud Mite

CECIL BLUMENTHAL

St. Ives, N.S.W., Australia

The eriophyid leaf mites of camellias have been well known for many years on the tea plant, *Camellia sinensis*. As far as can be determined, the bud mite of camellias has only been known for about forty years. These mites were first collected and recognized in California at Santa Paula, in November, 1940 by E. L. Smith and Romain Young; in 1941 at Santa Ana by W. W. Cadwallader and in 1944 at San Diego by S. V. Weimer and G. F. Prole of the Federal Survey.

Specimens of the bud mite collected on 8th March, 1945 by M. R. Bell of the State Nursery Service were recorded and tentatively classified in the same year by H. H. Keiffer of the California Department of Agriculture as *Aceria Camelliae* (Keiffer).

During his extensive studies of the eriophyid species of mite, Keiffer reclassified the leaf mites into better relationships with the other mites of this species that he was then recording and classifying. Accordingly the leaf mite previously named *Calacarus carinatus* (Green) was reclassified *Calacarus adornatus* (Keiffer) and *Acaphylla theae* (Watts) was reclassified *Acaphylla Steinwedeni* (Keiffer).

The camellia bud mite *Aceria camelliae* (Keiffer) damages the flower parts and the scales of the buds. With many Cultivars its worst effect is to delay the flowering of the plant until well into the

spring or to prevent the flowers from opening at all. Microscopic examination of the bud scales is the surest method of identifying the mite but it also shows its presence by causing browning of the margins of the bud scales and, with heavy infestations, the drying, softening and shrinkage of the bud.

Examining the mite in the bud scales, where they live, indicates that the heaviest infestations occur in the bud scales that are the hairiest. As a friend put it . . . like sheep grazing in a meadow.

Formal and other many petalled flower forms are usually the worst affected. The earlier flowering singles and simple semi-doubles will usually bloom quite well despite the mite although the flower quality usually suffers. It has been observed that many cultivars, including the formals and many petalled flowers, which are reputed to be difficult and erratic flowerers, flower quite freely and much earlier once the bud mites have been controlled.

Control of the bud mite can be effected at the same time as control measures are taken against the leaf mite and the juvenile scale insects, particularly as it is believed that the bud mites summer over on the leaves.

The best control has been achieved with the use of a miticide known as 'Dicophol' sometimes known as 'Kelthane' and packaged in Sydney as 'Red Spider Spray.' Our practice is to combine this with a spraying oil, which acts as a spreader and sticker, applied as a fine mist to the plant. The oil part of the spray effectively controls the scale insects.

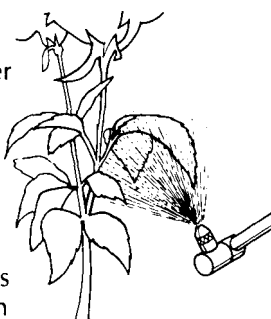
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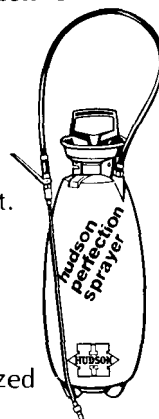
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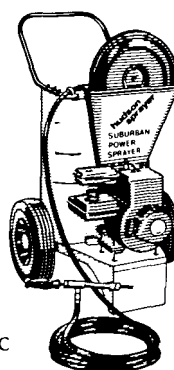
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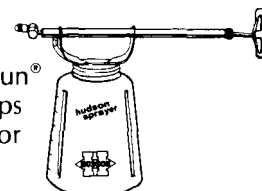
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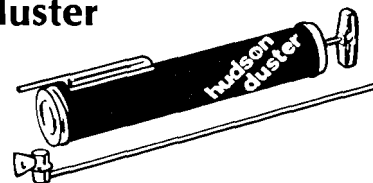


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Finding the Right Sprayer

Q. What's the best sprayer for a lawn with weed problems?

A. If your lawn is very large, you may need the ease and capacity of a power sprayer. Average size lawns can be treated effectively with a compression sprayer. For lawn spraying, use low-pressure and adjust the nozzle for a heavy, wet stream. On broad-leaf weeds, such as dandelions, spray any exposed part of the leaves. Make sure your sprayer has an on-off control. Then you can spot spray weeds right on target without wasting costly spray materials.

Q. Can I use the same sprayer for lawn weeds and other spraying jobs?

A. Because weed killing chemicals are hard to clean from a sprayer and a trace may harm desirable plants, it's best to use a separate sprayer for weedkillers.

Q. I've noticed my vegetable garden plants have holes in the leaves. What should I do?

A. Holes in leaves are usually a sign of insect attack. Once the pest is identified, select the proper spray material and a compression sprayer to suit the size of your garden. A one or two-gallon sprayer made of steel or plastic is good for a small garden. For larger gardens a polyethylene sprayer — like the new Perfection® sprayer from Hudson — in 3 or 4 gallons is convenient for spraying vegetable gardens and other yard plantings. Frequent inspections and a regular spray program will help keep insect problems to a minimum in the garden.

Q. Is a compression sprayer the best choice for a small patio garden?

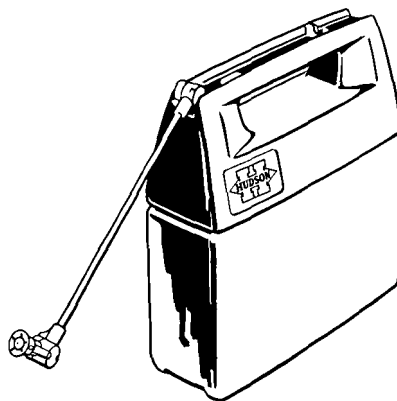
A. A small one-gallon compression sprayer is certainly adequate for a patio garden. If you have a few patio plants, you may want to consider a hydraulic hand sprayer. While not a compression sprayer, it has many of the same benefits, in a smaller size. These one and two-quart sprayers can develop pressure up to 150 lbs. This high pressure creates a fine mist for an effective, enveloping spray. This is especially good for small jobs.

Don't eat, drink or smoke. Eating or drinking while spraying could cause you

to ingest pesticide that might accidentally have gotten on your food or drink. Smoking is not recommended for two reasons. First, some sprays are flammable and, second, inhaling cigarette smoke may draw spray into your body with it.

Use the right equipment. According to H. D. Hudson Manufacturing Company, you should use a sprayer with a spray valve that shuts off when released. Sprayers that can be set to continue spraying automatically cause waste and excess application. They also risk spraying non-target areas.

For more information on lawn and garden spraying protection, contact: H. D. Hudson Manufacturing Company, 500 North Michigan Ave., Chicago, IL 60611. Please inform the company that you read the article in *The Camellia Journal* of The American Camellia Society.



Camellias are protected easily with the Hudson Cordless Electric

Q. Camellias and other fine plants may need to be sprayed quite often. What type of sprayer gives good coverage but doesn't damage delicate blooms?

A. Again, this depends on the size of your flower garden. Anything from a small hand sprayer to a power sprayer may be appropriate. But you do want to make sure that the sprayer you choose can provide a fine, enveloping mist to gently treat all parts of the bush. An adjustable nozzle will give you the versatility to spray properly under the leaves.

Q. I have a tree that needs to be sprayed for inchworms. How can I make sure the entire tree is treated?

A. By choosing the right sprayer, you'll reach even the tops of the tree. A small tree is easily treated with a compression sprayer. A Hudson Trombone® sprayer is ideal for long-range spraying. It operates with two-handed action and develops pressure up to 150 lbs. — shooting up to 30 feet. If you have an orchard or very tall trees, a power sprayer may be the best choice.

Q. How can I control annoying outdoor insects?

A. The best way to control flies and mosquitoes is to eliminate their breeding places and then spray their resting places. Flies breed in garbage and debris, so keep up with the chores. Any standing water in your yard should be eliminated to keep mosquito populations in check. Then spray the resting places of the pest — flowers, shrubs, other dense foliage, outdoor walls and under eaves. The sprayer you use for other lawn and garden jobs can be used for nuisance insects, too.

Q. Is there a general purpose sprayer that I can use for many lawn and garden jobs?

A. Yes. A compression sprayer is versatile enough to handle most lawn and garden spraying jobs. The features assure proper pesticide placement in a variety of situations. You can spray a low pressure, coarse stream for lawns, a fine mist for flowers and gardens and a long-range spray for shrubs and trees.

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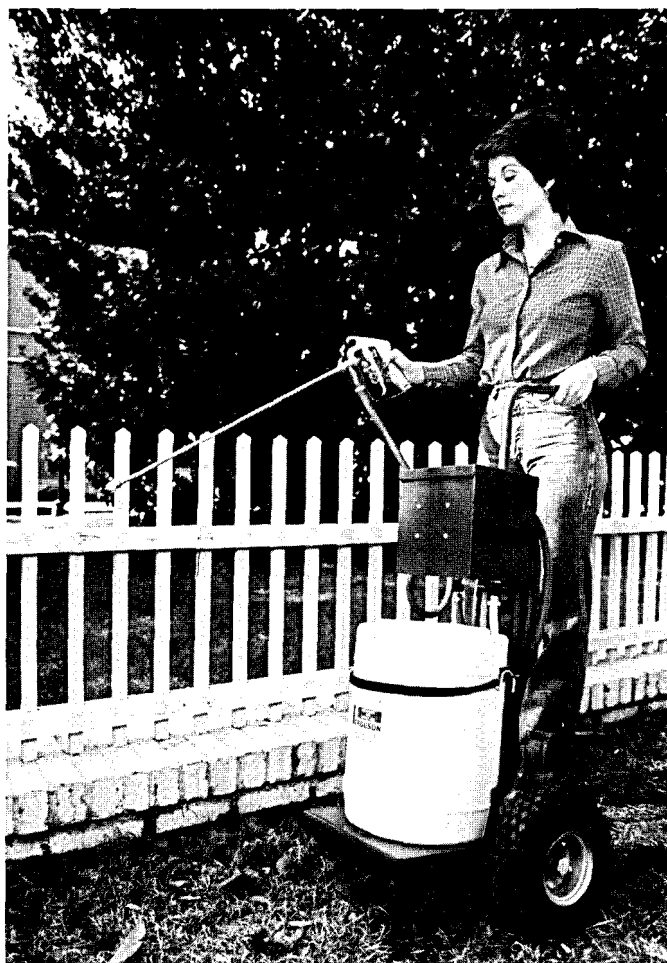


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Safety Rules For Spraying

Safety rules should be followed whenever a homeowner starts a do-it-yourself project. Spraying is no exception. Proper application of spray materials will produce better results — and that means a more beautiful yard and more bountiful garden.

Proper application begins with the proper equipment. Choose a sprayer that permits mixing chemicals exactly according to directions. This assures the mixture you apply is right. Also, look for a sprayer that gives you good control over the spray, with an on-off control and adjustable nozzle.

H. D. Hudson Manufacturing Company, a leading maker of sprayers and dusters, suggests the following safety guidelines for spraying.

Select the right pesticide. There is no such thing as an all-purpose pesticide. Insecticides control insects. Herbicides control weeds. And fungicides control fungus. With such a wide range of pesticides, you should know your enemy

before you choose the pesticide. The pesticide label identifies exactly which pests it controls. Using the right pesticide will provide the most effective control without damaging the plants.

Follow mixing directions on the label. Do not change the mixing proportions on the pesticide label. The proportions listed on the label will yield the most effective results. Don't overdo . . . and don't guess; use measuring utensils and mix only the amount you need for a particular job.

Spray on target. To economize on spray material, most experts recommend using a compression sprayer. Use a sprayer with a long spray extension and adjustable nozzle to place the spray precisely where it is needed. You'll increase the effectiveness of the spray and reduce waste as well.

Keep pets and children away. Make sure no one else is in the area when you spray. Keep children and pets away from the treated area for as long as advised on the pesticide label. Some pesticides are

toxic to fish, so check the label before spraying near fish ponds.

Don't eat recently sprayed fruits or vegetables. Pesticides now available normally break down in a short time. There is even a biological control that requires no waiting time. However, always consult the pesticide label for the correct waiting time before harvesting.

Spray at the right time. Hot, afternoon sun can evaporate some pesticides, so it's best to spray in the morning or evening. Spray on a windless day. If there is some wind, do not spray into it. You can minimize "drift" by spraying at a lower pressure and using the largest practical nozzle opening.

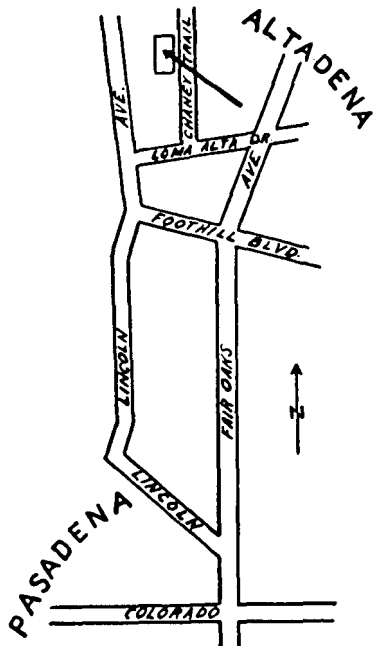
Wear appropriate clothing. Always wear a long-sleeved shirt and full-length pants. Some pesticide labels may also recommend that you wear waterproof gloves. When spraying overhead, such as trees or house eaves, wear a wide brimmed hat. If some pesticide does get on your skin, wash immediately with soap and water.

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Pesticide Use and Selection

PAUL BOCH
Agricultural Biologist
County of San Diego, California

The present day usage of the term *pesticide* connotes a much broader concept than that which is generally understood. A pesticide is any substance intended for preventing, destroying, repelling or mitigating any pest as well as any substance intended for use as a plant regulator* or defoliant**. The term "pest" includes insects, rodents, nematodes, fungi and weeds. The home gardener is usually concerned with the control of insects and fungi encountered in his garden.

To combat insect pests successfully it is important to know something about the manner in which insects develop and feed. Insects normally hatch from eggs laid by adult females and pass through several stages during their development.

* Including gibberellic acid.

** 2, 4-D, Roundup®, etc.

Aphids, plant bugs, leafhoppers, thrips and grasshoppers hatch into a form known as a nymph. The nymph resembles the adult except for its smaller size and the lack of wings. On the other hand, moths, beetles and flies hatch as a worm-like form called a larva. After the larva has grown to full size, it changes into an inactive form, the pupa. It is from the pupa that the adult emerges to begin the life cycle once again. The life span varies greatly with different species of insects. Some develop from egg to adult in a few weeks or even days while others may require a full year . . . or some even several years. Plant damage may occur during one or more stages of the insect's life cycle.

Insects can be divided into two main groups depending upon how they feed. The chewing insects bite off and swallow portions of the plant tissue. They may devour parts of or whole leaves or flowers or they may bore into stems or feed upon the roots. Sucking insects have beak-like

mouth parts which are used for piercing the plant tissue and sucking the plant juices for food.

Not all insects encountered in the garden are injurious. A number of species help us by destroying pests. These beneficial insects are generally divided into two groups: the predators and the true parasites. The predators prey upon and devour other insects. Examples of these are the ladybird beetles (lady bugs), assassin bugs, the praying mantis and the larvae of syrphid flies and lacewing flies. The larvae of parasitic insects live in or on the eggs or bodies of other insects; which they destroy. The adults of most parasites are tiny wasp-like insects or small flies.

There are four main steps in controlling pests.

1. **Observation** — A skilled eye is at least as important to a gardener as is a green thumb! Frequent visits to the garden and close observations often allow the gardener to spot a problem before real damage occurs. The most obvious damage to spot is from chewing insects though it may take some time to identify the culprit. The insects with piercing/

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sucking mouth parts are not always as easy to spot. Many are also very small. Aphids cause curled and distorted leaves which will later turn a rusty color. The sucking and rasping action of thrips dries the edges of the sepals and is responsible for much of the blasting of buds. Scale insects are usually found on stems and undersides of leaves. They usually excrete quantities of honeydew, as do aphids, upon which sooty mold fungus grows. Mites usually cause a silvering of the leaf surfaces in the later stages of damage.

2. Hand Picking — Where the pests and host plants are few in number this method may be effective such as the control of snails and some leaf feeding caterpillars. This approach also works with some disease problems. Die-back and leaf gall are both controlled by cutting back beyond the infected parts and destroying. This leads to a third means of control.

3. Clean Culture — Remnants of plants should be destroyed as soon as practical. Weeds should be removed promptly for they often harbor and serve as breeding places for many insects and mites. The centers of large plants should be pruned clean to allow air circulation and to eliminate weak and stunted growth.

4. Pesticides — Many times pesticides are the only dependable means of holding pests in control. Those pesticides dealing with insect pests are called insecticides and may effect their control in several ways. Contact insecticides penetrate the body wall to cause death; pyrethrum, diazinon®, malathion® are examples. The insect must be present at the time of spraying and must be contacted for these products to be effective. There are also residual sprays which are a special kind of contact spray. Residual sprays are applied in such a way that a film-like layer forms on the surfaces of the plant or that the spray is absorbed (systemic action) by the plant tissues so that later contact or feeding will kill the insect.

Insecticides may be grouped according to the way in which they affect their intended hosts. The natural pyrethrins and their synthetic counterparts usually have a rapid knockdown for they act on the nervous system. The organophos-

phates such as diazinon and malathion have as their toxin an inhibitor of the enzyme cholinesterase. The carbamates, such as Sevin®, also act by lowering the cholinesterase level and affecting the nervous system; A new group of insecticides known as insect growth regulators are coming onto the market. They work by upsetting the juvenile hormones and keep the insects from reaching maturity.

Besides insects, ornamental plants are also subject to many diseases both parasitic and non-parasitic. The parasitic diseases are caused by those plant organisms which lack their own food making capabilities and must obtain food from other plants, living or dead. The fungi and bacteria fall into this group.

Non-parasitic diseases are those problems which are caused by non-living factors such as malnutrition, mechanical and chemical injuries, extremes in weather and general environmental conditions such as salt damage, sunburn and smog.

The most important step in using pesticides is the accurate identification of the pest requiring control. Your local agricultural extension office, will be found most useful as well as your local library and nurseries. Certain insecticides used to control chewing insects will have no effect on sucking insects. Likewise, a fungicide will have no effect upon non-parasitic diseases.

All pesticides have one thing in common . . . they all have a label. *READ IT!* The label will tell you the true or scientific name of the product, the manufacturer's name where more information or help may be obtained, a listing of all materials in the product, the pest(s) to be controlled, directions for safe use and handling, method of application and finally, antidote and first aid instructions. Chemicals are toxic to man and animals in varying degrees depending upon many factors: type of animal, the chemical involved, and the mode of entry into the body. This entry may be by respiration, ingestion or absorption through the skin. The toxicity of a pesticide and its hazardness are not the same thing. Toxicity is a measure of how much pesticide is required to kill a certain percentage of test animals. Hazard on the other hand is the degree of danger involved in exposure to the product as it is used. Most

pesticides are used in a diluted form so that the hazard of the chemical is less than its toxicity.

Even the most toxic pesticide can be safe for the environment and the user if properly used. The best guide to its environmental effect is, once again, the label. Proper clothing should be worn . . . long sleeves, legs and head covered, gloves and in the case of the more toxic a face mask or respirator. In addition to following the label instructions remember to mix only the required amount of the chemical, add a wetting agent to assist in full coverage of the leaves and in some areas it is advisable to check the pH of the water. If the pH is too far from neutral (pH = 7) add a buffering agent for the adverse pH may make the pesticide ineffective. Best results are achieved by directing the spray from below to cover the under surfaces of the foliage and then from above to cover the upper surfaces. Keep the solution agitated to insure a uniform mixture and apply as a fine mist. Never spray when winds are strong to avoid carry-over of the spray material.

Pesticides, especially when improperly prepared (the "more is better" complex) may be too strong for tender foliage and result in burn conditions. Overuse may also lead to insect resistance. When possible, it is best to alternate between the use of two or more insecticides to minimize this developed resistance.

When the spraying job is done all equipment used should be thoroughly cleaned and stored. All sprays and equipment should be stored in a locked area and all containers should be clearly labelled. Finally, wash or bathe immediately and launder all clothing before wearing again.

(ED. NOTE: Mixing of more than one pesticide into one spray should be done with great caution and in strict accordance with the labels. Even then, precautions should be taken when switching brands of the same chemical(s). It is advisable to experiment on only a few plants before exposing the majority. Special care is required if one of the chemicals is an oil.)

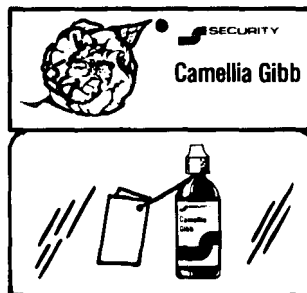
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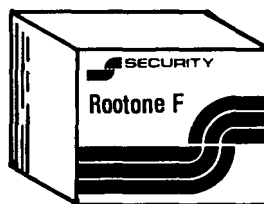
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Some Diseases of Camellias

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Of the diseases that affect camellias only a few such as damping off, *Phytophthora root rot*, *Armillaria root* and several less common diseases result in the death of the plants. The rest of the diseases result in unsightly appearances but most do not severely damage the plants. The most serious of these, camellia petal blight, will be discussed elsewhere in this publication. *Phytophthora root rot* will also be discussed elsewhere. The diseases discussed here will include such non-infectious diseases (those resulting from an interaction between the plant and an unfavorable environment) as salt damage, sunburn, scab, and excess light damage. Infectious diseases (those in which there is a causal agent which can spread to other plants) will include damping-off, *Armillaria root rot*, *Pestalotia leaf spot* and *virus variegation*.

NON-INFECTIOUS DISEASES

Salt damage is a common problem on camellias. It is more frequently found on plants grown in containers but can also occur on plants in the open ground. Salt damage appears as a marginal burn of the older leaves. The affected tissues die and turn brown. Sometimes tissues adjacent to the dead areas may be yellow. The disease results from a build up of salts due principally to cultural practices.

Salts may result from those naturally in the soil, from those in irrigation water or those resulting from the use of fertilizers. Build-up of salts is common where adequate leaching is not practiced. Control results from growing camellias in a medium which drains well and from using enough water to leach the soil adequately every two or three weeks. If plants are grown in containers, never let the pots sit in water which has drained through them.

Sunburn appears first as bleached, yellowish areas between the veins. These areas eventually die and become tan or brown. The dead areas are distinctly between the larger veins but may coalesce to give the appearance of a large area

being affected. Once killed, secondary fungi may invade the dead tissues and cause them to turn various shades of brown or black. Plants supplied with adequate water are not affected and only those which are allowed to go dry will burn if exposed to hot sun. Control results from good horticultural practices. Plants that are grown inside and moved into the bright sunshine also will sunburn but the tissues will be bleached almost white.

Scab or corky scab appears as small, water-soaked spots which develop into raised, dark tan or brown outgrowths on the undersides of the leaves. They may be scattered or in groups and frequently they may be concentrated toward the margins of the leaves. Secondary organisms may invade these dead tissues and cause color changes. The exact cause of this problem is not known. In some parts of the country, sprays of anti-transpirant materials have prevented further development of the problem. Care must be taken to prevent injury when such materials are used.

A **yellowing** of the new leaves of camellias occurs in certain climatic areas such as coastal California. The new leaves become bleached a pale green or yellow in no pattern except that those which are more exposed are affected more severely. If such a problem occurs, provide plants with more shade or move them to a more shady area.

INFECTIOUS DISEASES

Damping-off is a disease which results from infection by any of a number of different fungi. Commonly *Pythium* spp. (water molds) or *Rhizoctonia solani* are the causal agents though other fungi may be involved. The damping-off fungi may invade the seed before it germinates causing it to decay. They may also invade and kill the young seedlings before they emerge. Damage from seed decay and pre-emergence damping-off frequently is blamed on poor seed when it actually is a disease problem. In post-emergence damping-off, the fungi attack the young seedlings at the soil line, girdle them and cause them to die. Control of damping-off can result from good cultural practices. Don't plant seeds too deeply for

they use too much energy reaching the surface and then are more susceptible. Don't plant them too closely. Competition will make them weaker. Don't over-water for this will weaken the seedlings and will favor the causal fungi. Don't fertilize until transplanting or thinning for this also will make a more susceptible plant. Seeds can be treated with a fungicide such as thiram to give control. Seeds should be sown only in new or well-cleaned pots. Planting in pasteurized soil mix also can help give control. Small quantities can be pasteurized in an oven by heating moist soil (enough moisture for planting) at 140° for 30 minutes. Do not heat longer than 30 minutes or higher than 140°F for both will kill many of the beneficial organisms. These root rotting organisms may invade cuttings also and cause them to rot. Sanitation is important in controlling this phase of the disease.

Armillaria root rot (oak root fungus root rot, mushroom fungus root rot, shoe-string fungus root rot) is a serious disease in many areas. Affected plants may yellow, drop their leaves and die. Death may take a short time or the plant may decline over a long period. The fungus



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attacks a large number of woody plants including camellias though the latter tend not to become infected very frequently, because they tend not to have deep roots. *Armillaria* is not found too near the surface because it will not survive drying. Although the fungus infects roots, it is not found in the soil or growing through the soil. It exists only in old infected roots. Because of this, removal of all woody roots in the upper 2 to 3 feet of soil in an area where the fungus exists will help give control in camellias because they are not deep-rooted.

The fungus can be detected by examining the area between the bark and the hardwood of the main stem at or below the soil line or of the larger roots. If present, it will appear as a white layer between the bark and the wood. When fresh, it will have the odor of fresh mushrooms. During the late fall or early winter, the fungus may produce mushrooms around the bases of infected plants.

Pestalotia leaf spot. Species of *Pestalotia* are not very infectious on camellia but may invade injuries resulting from sun burn, scab, insects or mechanical injuries. The affected dead areas are silver-gray on the upper surface and usually light brown on the lower surfaces. These tissues may be dotted with small dark fruiting bodies of the fungus. Control results from preventing injuries.

Virus variegation. This disease in camellia may affect leaves and flowers. In both, the variegation consists of round blotches rather than linear color changes. Varieties with light colored flowers do not become variegated so the color change can be detected visually. Infected

leaves show large yellow blotches. The virus is transmitted only by propagating from infected plants. Cuttings, buds, scions and root stocks from infected plants will have the virus. It can spread from infected scions into root stocks and vice versa. Virus symptoms appear to be influenced by temperatures and plants grown under higher temperatures tend to show more color breaking. There is considerable concern about using virus-infected propagative material to transmit the variegation to other varieties. However, because it can be controlled by propagating new wood from plants ex-

posed to 100°F for 3 weeks, the problem appears not to be that serious. Some system needs to be devised for naming of varieties which do show color break symptoms. They could be given the same name as the original variety but should be designated as the variegated form or some similar designation so that the true nature of the variegation is given in the name of the variety.

(ED. NOTE: Many states publish excellent Bulletins covering diseases and insect pests affecting various plants and crops, including camellias. Contact your county Agricultural Extension Service for available literature.)

Integrated Control Phytophthora Root Rot

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PHYTOPHTHORA ROOT ROT is the most serious problem — a life and death matter — facing camellia culture today. This is a practical article about materials and methods for controlling *Phytophthora* root rot; but to get the most out of this topic and, hopefully truly to advance you in your efforts to combat this disease, I am going to review critically some of our current approaches to disease control and recommend what, for many, will be some new lines of thought and practice. If you are looking for the "quick fix," this article is not for you. There is no quick fix for *Phytophthora*. Real control of root rot requires attention to many factors, not the least of which is proper culture. In this article we will look at how to deal with the whole situation. I am not going to recommend a sole, specific chemical control as the major answer. Instead, I will recommend a much broader approach to the practical and effective control of root rot.

Many of us are quick to jump on the chemical bandwagon as a sole or overriding approach to the control of plant diseases. Even when we are presented with a very effective chemical, we frequently abuse it through over-use or misapplication. The compound benomyl (trade name — Benlate) is a good case in point. It was hailed upon introduction as a panacea for many fungus disease problems; but after a few years, it had become ineffective in some areas because of misuse. Similar problems arose with Streptomycin which, at first, was extremely effective in controlling some bacterial diseases. Readjustments in thinking and in the methods for employing such chemicals have restored some usage of these otherwise good materials. Through analysis of mistakes, plant disease control emerges with new understanding and a very productive outlook.

Don't get me wrong. This article is not going to argue against the use of chemicals; instead, I am going to discuss proper integration (coordinated use) of chemical controls with other nonchemical measures for the purpose of managing *Phytophthora* root rot in the nursery and garden. Notice that I used the word *managng*, since in many areas where *Phytophthora* is widespread today, eradication of the fungus is impossible or im-

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practical. For the moment, we will be wise to learn how to live with this fungus when it is present while trying to prevent its spread to noninfected areas.

The Fungus and the Disease

Phytophthora cinnamomi Rands was first reported only as a parasite of cinnamon trees in Sumatra (Rands, 1922; hence, the name "cinnamon root rot"), but is now known to attack over 950 varieties and species of plants around the world, mostly in tropical to warmer temperate areas (Zentmyer, 1980). This fungus probably originated in the ancient tropical areas which now include Malaysia and northeastern Australia.

Phytophthora belongs to a relatively primitive group of water-loving fungi, hence the frequent association of its root rot diseases with overwatering or poorly drained situations. One of the reasons this fungus prospers in wet conditions is because it forms swimming spores, called zoospores, that propel themselves in the soil water to susceptible roots or from plant to plant. During suitable wet periods, thousands of zoospores can be released in a single growing container or area in the ground and can attack many roots and many locations on individual roots. The fungus also forms thick-walled "resting" spores that assist in its survival and persistence outside the plant — even under dry conditions for periods of two years or more. When the fungus is present in an area, its populations in roots and as soilborne or potting-mix-borne spores usually increase, thereby magnifying the incidence or threat of disease. Spores can be washed into and can infest soil beneath container-grown plants, and can later serve to reinfest new or old stock.

Once it attacks a plant, the fungus forms microscopic threads (hyphae) that ramify through and bring about a soft rot of the roots. The rot and death of roots starts in the young feeder roots but can progress to older roots, eventually killing the entire root system. Under some conditions, camellias may regenerate roots only to have them destroyed in turn. As the root system is destroyed, the uptake and assimilation of water and nutrients by the plant are greatly thwarted. Damage to the root system may cause marginal firing of leaves as might happen in overfeeding or water stress, or may cause symptoms associated with mineral deficiencies (Stoner, unpublished). In early stages the plant declines in vigor and may show some tip dieback, delayed flower bud opening or bud drop, smaller-than-normal leaves, limp leaves, and/or an abnormally pale green color. In advanced cases, temporary or permanent wilting leads to extensive dieback or total death of the plant. Visible symptoms above ground are usually exacerbated by stressful conditions. Occasionally, whole plants that at first appear reasonably healthy will wilt and die in a few days. This "sudden death syndrome" as I call it is usually associated with the sudden onset of hot, drier, stressful weather. Actually what happens is that root rot proceeds actively during cooler, wetter, less stressful periods when symptoms of water deprivation are not as likely to appear; then, when warm weather suddenly ensues, the root system fails to meet the plant's urgent demands for water, and death occurs.

P. cinnamomi has strains with different abilities for attacking certain plants. Studies to date

(Zentmyer and Guillemet, 1981; Meechan and Stoner, unpublished) indicate that only the so-called A¹ mating type among California isolates is able to cause disease in camellia. The A¹ type can attack avocado trees (*Persea americana*) and other plants; but the more common A² type found frequently on avocado and many other hosts worldwide may not attack camellia. This situation has prompted some avocado growers and advisors to be wary of infected camellias as a possible threat to their crops. Such concerns affect the way they and others may look upon the camellia plants produced for sale by many nurseries.

The fungus is spread from one area to another by the movement of soil, water, or plants. In some areas it is difficult to find plants that are free of *Phytophthora*. Therefore, exclusion of the fungus is difficult, and we must consequently focus great attention on protecting and strengthening the camellias and discouraging the fungus in any way we can. To achieve these goals, it is helpful to think about how the fungus behaves; what conditions it prefers and benefits from; where it resides in growing areas; how it survives; how it is moved from place to place; and the kinds of camellias it most readily attacks and propagates on.

Chemical Control Alternatives

Phytophthora attacks the roots of camellias. Therefore we need a chemical control material that is economical, effective against this fungus at relatively low concentrations, suitable for use as a drench in soil or planting mixes, and that has lasting ("residual") effects even under the potential leaching effect of frequent watering. These requirements eliminate most if not all of the older, established chemicals. Some relatively recently developed chemicals, which tend to be rather specific in their action spectrum (organisms they affect), either are ineffective against *Phytophthora* (e.g., benomyl or Benlate) or of limited value in residual or potency categories (e.g., ethazole).

Metalaxyl, known in the trade as Subdue (or Ridomil) has shown much promise for use against *Phytophthora*. The Subdue formulation is intended primarily for drench applications and other root/mix treatments in the control of ornamental plant diseases.

My experimental studies have indicated the strong effectiveness of Subdue in controlling *Phytophthora* root rot in container-grown camellias. *I deliberately specify root rot control because the chemical does not eliminate the fungus.* This throws a special light on our interpretation of its effectiveness and its best applications.

I tested the active ingredients of Subdue (then known as experimental material CGA-48988) on camellia plants in a wholesale nursery situation to evaluate its effectiveness in the control of root rot caused by *Phytophthora*. The compound was applied mostly to seedlings in four-inch pots (0.15 pint/pot) and grafted plants in gallon cans (0.4 pint/can). The compound was applied in water at the recommended rate (for the 48988 formulation; check the Subdue label for current recommendations) of 1 ounce active ingredient per 100 gallons of water. For "control" comparisons, other similar plants in the same areas were treated only with water. All treated plants were kept on soil beds

known to be infested with *Phytophthora* (pots in lathhouse; cans in open field areas). Many plants, particularly the four-inch pots and grafted plants in gallon cans were already infected and showed root rot. Conditions during the treatment were considered typical for an affected nursery operation. Over 500 plants were treated.

Plants were examined up to five months after treatment. A rating scale was used to evaluate the condition of plants: 0 = dead at end of five months; 1 = alive but stunted or graft failure; 2 = alive, moderately vigorous, acceptable for sale; and 3 = alive, very vigorous, excellent appearance. Vigor was based on bud activity and evident growth, timely shoot growth, fully developed leaves, good and numerous flower buds (in larger plants), and lack of evident disease symptoms.

Among the grafted, gallon-size stock, the 48988 (Subdue compound) proved most effective: 90% of the plants were judged saleable (2 & 3 ratings) five months after treatment, as opposed to 80% in the control. Five months after treatment, 76% of the 48988-treated plants received a 3 (vigorous) rating, whereas only 54% of the controls were so judged.

In the potted seedlings, held in a crowded area with intense disease pressure (very high fungus population, high moisture conditions, and weathered mix), 93% of the 48988-treated plants were in saleable or useable condition (2 & 3 ratings) five months after treatment, as opposed to 53% in the control lot — a very pronounced difference. Plants still rated as vigorous five months after treatment accounted for 77% in the 48988 lot and only 9% in the control lot.

Control was in no case complete, but was impressive under the given conditions. It must be noted that some root rot and the presence of *Phytophthora* were observed in the 48988-treated plants as well as in the controls. About 10% of the plants in the 48988-treated pots had conspicuously rotted roots. This points to the fact that CGA-48988 (Metalaxyl or Subdue) is not an effective eradicant; but the chemical does decrease diseased incidence and impact. While its beneficial effects may create a very healthy-appearing group of plants, it is very possible that *Phytophthora* is still present and waiting for a chance. Similarly, it is therefore possible for nurseries using Subdue or comparable compounds to produce apparently healthy, symptomless carriers of *Phytophthora*. This is not all bad. For many years, some growers have been selling untreated and reasonable healthy-appearing plants that carry *Phytophthora*; the fungus is widespread. The possibility of distributing treated plants that may be symptomless carriers indicates in part that we have not yet achieved the total level of control desired or, in other words — chemicals alone are not the complete answer.

My treatment with 48988 did appear to at least hold existing infections, and it is possible there may have been some curative effects; however, as noted elsewhere in this article, use of Subdue as a therapeutant on badly infected plants is a mistake and is not recommended.

The 48988-treated plants were superior to controls consistently in having larger leaves; in holding their leaves; having healthy roots; in forming strong flower buds; and in having more extensive root systems that extended at least ¾ of the way to the

bottoms of containers. There appeared to be a possible tendency toward larger roots in the 48988-treated plants.

The long-term effectiveness and value of Subdue remains to be evaluated. So far it has shown outstanding potency at low concentrations; long residual effects (up to 3-5 months in trials); and strong overall effectiveness in preventing or minimizing disease. It should be noted, however, that in some crops other than camellias, Metalaxyl (the active ingredient of Subdue) has failed to control diseases after initial successes, usually because of the buildup of resistant strains of fungi. Such "breakdown" in effectiveness of the material is probably in most cases related to improper usage of the chemical over and over again by itself.

This means that if we are to use Subdue to good advantage and expect it to work dependably in the long run, we must employ it properly in our control programs. Using Subdue as a case in point, we can examine approaches to the most effective use of a modern, group-specific fungicide such as this one. Before discussing applications and methods, we should review characteristics of the product.

The active ingredient is quite specific in its activity against fungi. It is effective only against *Phytophthora* and its allies such as *Pythium* and the downy mildews. The chemical affects only certain stages or developmental phases of the fungus or its infection process, and it may interact in some way with the plant's physiology to limit disease development (Staub and Young, 1980). Although it inhibits the germination of resting spores of the fungus, it is not an eradicating agent that kills all spores outright. Furthermore, the chemical is most effective at relatively low concentrations when it is absorbed into the plant, as opposed to being free in the soil.

Two advisory ideas therefore emerge: (1) this chemical should not be used as a bare soil treatment as would be done with a true eradicating agent, and (2) it should be applied to living plants in place in the ground or containers for most effective action at low concentrations. In camellias, it should be drenched into the root ball area.

Many people have recommended the use of Subdue on already sick plants, quoting glowing testimonials of recovery. Such recovery has been noted, and such treatments might have certain valid, limited applications; but general use of Subdue as a therapeutic or curative agent is a serious threat to the chemical's long-term effectiveness and value. Why? First, consider that in an infested container mix or soil and in/on the roots of infected plants there may be mixed populations of *Phytophthora* individuals with different hereditary backgrounds and potentials. In the realm of a nursery or garden, some of these individuals just might carry genes that confer resistance ("immunity") to Subdue. The bigger the populations of *Phytophthora*, the more chance that a few Subdue-resistant strains might be present — sort of "waiting in the wings to make their appearance!" The mixes and root zones of infected plants can be expected to have much bigger populations of *Phytophthora* than new mixes or healthy plants newly exposed to the fungus. Therefore, if we persist in applying Subdue indiscriminately to such diseased systems with large fungus populations, we are, in effect, killing off or limiting the Subdue-sensitive strains while, at the same time,

challenging and encouraging the resistant individuals (previously in the minority) to propagate freely with less competition and to become common. If we continue to use Subdue alone and regularly in such a situation, the chemical-resistant strains may develop large populations and spread about the entire growing area, infecting new plants. As these strains increase, root rot reappears as a major problem and the effectiveness of Subdue is lost. Conceivably, in just two or three years the compound could become totally useless!

This leads us to another major point: Subdue should be used usually as a preventative or protectant in newly transplanted or reasonably healthy stock, not as a curative agent. Proper use should minimize the increase of troublesome resistant strains.

Regardless of use, however, we can probably expect Subdue-resistant strains to appear and to spread and become more common. As plants change hands, even conscientious users of the chemical will probably receive these strains. To prevent or slow this process or to minimize its impact, we should integrate the use of Subdue or similar chemicals with cultural controls and consider the co-application of our chief chemical with a secondary, broad-spectrum compound to "catch" those fungal strains that might elude the major control material. Such co-application or dual fungicide use is now in effect in some crops other than camellia.

In summary, observe the following when using an organic, group-specific product such as Subdue:

1. Follow label instructions and restrictions, using recommended dosages and intervals of treatment.
2. Do not use on bare, unplanted mix or soil unless specified on label.
3. Avoid usage on already sick plants or, if you must do this (e.g., to save a rare or special plant), keep these plants away from others and consider the possibility of co-application with another fungicide to thwart resistant strain buildup.
4. For general usage consider the co-application of the fungicide with another product; consult local advisors and check the label for compatibilities and recommendations.
5. Apply as a soil drench around living plants.
6. Preferably treat plants in a protective or preventative manner when first planted, received, or transplanted.
7. Avoid routine applications between transplantings that are more frequent than recommended on the label.
8. Populations of *Phytophthora* can increase with time if left unchecked. This fact may justify periodic treatments of older stock held for sale in nurseries or for enjoyment in the home garden. If such plants show evidence of progressing root rot, consider discarding them or barerooting, treating, and planting them (see Cultural Controls).
9. Design an integrated program of control with chemical usage teamed with sanitary and other cultural practices.

We should address very directly and honestly the goal of producing disease-free plants and plants

that are not symptomless carriers of *Phytophthora*. Misuse of control chemicals such as Subdue could produce healthy-looking plants that still carry the fungus. Truly integrated control programs permit highly effective use of fungicides while taking advantage of additional safeguards and thereby bring us closer to producing truly healthy, fungus-free plants.

Cultural Practices for Integrated Control

The use of cultural disease control measures should be viewed as being at least as important as any chemical measure. Indeed, they may in the long term be more important to sustained, profitable production of plants. Cultural procedures strengthen the plant, disfavor the disease-causing agent, and minimize disease-supporting conditions. Cultural measures invoke many different beneficial factors or effects that act in concert to promote plant health. Indeed, if cultural measures are fully observed, it is possible that, even in the presence of *Phytophthora*, disease levels might be maintained at an acceptably or practically low level. Combined with the proper use of an effective chemical, integrated cultural controls constitute a very potent protective force. Preventative and protective forces are less expensive in the long run.

The following cultural measures are highly recommended for use wherever practicable.

1. Plant in well drained and aerated planting mixes that hold up well and have a minimal tendency to settle, stratify, and compact over time. In dry climates, use bark chips or other mulches as necessary to retain moisture in mixes.
2. Use good-quality organic mix components such as peat to prevent quick breakdown, stratification, compaction, and waterlogging. Use perlite or other suitable, durable materials to lighten and help aerate mixes.
3. Do not reuse mixes or mix components; they could contain spores of *Phytophthora*. Store unused soil or mix components off the ground and clear of dumps or other areas where work activities might bring used and new mixes in contact.
4. Keep containers elevated off soil in holding areas. Soil may be infested with spores from earlier activity. Also, elevation tends to discourage movement of soil animals, some of which carry *Phytophthora* spores, into containers.
5. Graft scions onto resistant or tolerant rootstocks such as *Camellia sasanqua* to minimize propagations of the fungus and to give plants a healthier root system.
6. Do not shift plants to oversized containers, and don't plant in overly deep containers. Roots serve to balance the water economy in a container system. If large areas of unused (non-root occupied) mix persists for too long in a container, it could become compacted and overly wet and supportive of the fungus and root rot.
7. Keep old and/or diseased stock separate (at least out of splash zone) from healthy or new

(Continued on page 30)

Why You Will Attend The 1983 ACS Fall Meeting

DOUGLAS DEANE HALL

Dinner Speaker to Be Ray Blackman

Ray Blackman, Vice-President of Brielle Galleries, Brielle, New Jersey, will be our guest speaker at the dinner on Friday evening, October 28th, at Longwood Gardens. Ray is a long-time friend of the ACS and was the one to arrange for the fabulous additions to our Boehm collection. (See the article and color pictures on inside front cover and beginning on page 1.)

The after-dinner talk will be on porcelains, a subject on which Ray is a foremost expert. He will be accompanied by his lovely wife Sherry and perhaps other officials of the Brielle Galleries. He also plans a display of some porcelain pieces. Brielle Galleries, in addition to Boehm, sells other porcelains, exclusive jewelry and fine gifts such as Herend china. Connoisseur of Malvern designs its porcelains exclusively for Brielle Galleries. This collection, known as "As seen through the eyes of a butterfly," includes the limited edition camellia 'Ann Blair Brown' in a basket and being "eyed" by a butterfly.

You will see at the dinner "A Quest for Excellence," the gloriously colored catalogue of Brielle Galleries. Each one of these has, in the past, been the epitome of

In your most fanciful dreams a few years ago did you ever picture yourself in Pennsylvania attending an American Camellia Society meeting?

No, but times do change! Dreams will encourage you to go and most probably you will be in the southeastern corner of Pennsylvania October 27-30 very near the city of Wilmington, Delaware for the ACS Longwood/Winterthur Fall Meeting. You will pleasantly dream about it long afterward.

Attracting large numbers of ACS members will be:

(1) The location. Driving time varies from 30 minutes to a few hours for 150 ACS members residing in the 11 states from Delaware to Maine and Massachusetts to Ohio. There are 45 in New York alone. And no Southerner is a bit disloyal by overstepping the Mason-Dixon Line just an "eency-weency decile" of miles into Yankee territory. That's less than a Minie ball could travel! Two impartial Englishmen, Charles Mason and Jeremiah Dixon, surveyed the straight east-west boundary separating Maryland from Pennsylvania in 1763-67, a line commonly accepted as dividing North and South.

- (2) The schedule of events alone would draw many.
- (3) Longwood's famous gardens and Winterthur's unsurpassed collection of decorative arts in themselves bring thousands of visitors annually from all over the world.
- (4) Exposure to greenhouse camellia culture will be abundant and thorough.
- (5) Infusion of geographic and cultural diversity by increased Northeastern representation at this meeting will benefit all attending members in the same way that the presence of members Esther Parker of Massachusetts and the A. Reading Van Dorens of Connecticut at the last two meetings served to broaden friendships and horizons.
- (6) Multi-colored fall foliage normally reaches a peak at Longwood/Winterthur the latter part of October.

Convention headquarters at Chadds Ford, a 6-story Ramada hotel/motel, presents a striking contrast to the pre-Revolutionary surroundings. It was here in September, 1777, where an important wagon road forded the Brandywine

MAIL TO

Chadds Ford



ROUTES 202 & 1
1110 BALTIMORE PIKE
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ATTENTION OF:

SANDY CEAR
Director of Sales

This completed **RESERVATION REQUEST** form must be received by Oct. 10, 1983, to guarantee reservation

NAME _____

COMPANY NAME _____

STREET ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

PHONE NO. () - _____

☐ 6 P.M. HOLD

☐ GUARANTEED RESERVATION — FULL ADDRESS & CHARGE CARD # REQUIRED

☐ ANTICIPATED ARRIVAL TIME _____

☐ NUMBER OF NIGHTS _____

CHARGE CARD # _____

DATE OF ARRIVAL _____

SPECIAL ROOM REQUESTS
(Given Upon Availability)

- ☐ ADJOINING ROOMS
- ☐ CONNECTING ROOMS
- ☐ EXECUTIVE SUITE \$55 + 7% (\$10.00 Extra)
- ☐ SINGLE \$35 + 7% tax
- ☐ DOUBLE \$45 + 7% tax

GROUP RESERVATION. AMERICAN CAMELLIA SOCIETY CONVENTION

COME TO LONGWOOD GARDENS, HEAR!

for

American Camellia Society
Annual Fall Meeting, October 27, 28, 29, 1983

The American Camellia Society is bringing East Coast/West Coast/Gulf Coast together for a real Camellia Treat on October 27, 28, 29, 1983 at Longwood.

Look at the superlative program:

- Outstanding Horticulture & Educational Program
- Wine Reception and Camellia Show on Thursday
- Longwood Gardens and Educational Program on Friday
- Lunch & Organ Concert at Longwood Ballroom, Friday
- Dinner at Longwood Terrace Restaurant, Friday
- Winterthur Museum, with lunch there . . . Hagley Museum, Saturday
- Banquet, short business statements, music at Ramada Inn, Saturday

Registration Fee includes: the wine reception, camellia show, a cocktail hour, two banquets, two lunches, bus transportation and the educational program and the entrance fees to Longwood, Winterthur and Hagley. What a Bargain Meeting!

The rooms at the quite new Ramada Inn are lovely and reasonably priced. For **Hotel Reservations** write or call directly Sandy Cear, Chadds Ford Ramada Inn, Routes 202 & 1, 1110 Baltimore Pike, Glenn Mills, PA 19342, telephone (215) 358-1700. Prices are only \$35.00 single and \$45.00 double. There are some suites available also.

MAKE YOUR REGISTRATION RESERVATIONS DIRECTLY TO:

Convention Chairman, American Camellia Society, P. O. Box 1217, Fort Valley, GA 31030; telephone (912) 967-2358.

Enclosed is \$_____ Registration Fee for _____ persons to attend the Annual Fall Meeting of The American Camellia Society, October 27, 28, 29 at Longwood.

(Registration Fee \$90.00 for all events sent prior to 1 October 1983; \$95.00 after 1 October 1983.

Name: _____ Name: _____

Address: _____

Telephone Number: () _____

CAMELLIA SHOW, OCTOBER 27, 1983

The Camellia Show to be held in conjunction with the Annual Fall Meeting will be at the Chadds Ford Ramada Inn. Blooms to be entered from 1 PM to 4 PM on Thursday, October 27th. Prizes galore — let's have a good FIRST ACS Camellia Show that we know of in Pennsylvania. For schedule and details contact Dr. Arthur Maryott, 4404 Maple Ave., Bethesda, MD 20814, tel. (301) 654-5727. Bring blooms.

River that General George Washington fought a costly battle with the British. His casualties numbered 1,000, and Lafayette was wounded. A few more defeats in the unsuccessful effort to prevent British capture of Philadelphia led Washington's battered forces to a long and bitter winter encampment at Valley Forge.

The fame of the Brandywine Valley derives from more than a Revolutionary battle. Fifteen miles downstream the little river flows through Delaware's largest city to join the wide Delaware River. Just short of the city, Eleuthere Irenee du Pont de Nemours established a foundry on its banks in 1802 which flourished and eventually became one of America's giant chemical industries. This is now the site of the Hagley Museum, which we will visit.

Five miles west of Chadds Ford lies Longwood Gardens, 15 miles northwest of Wilmington. Halfway between Longwood and Wilmington is Winterthur. Twenty miles east of Chadds Ford you find the Philadelphia International Airport; downtown is 5 miles further. William Penn founded the city in 1682,

along with the colony of Pennsylvania. The Continental Congress met there nearly a century later and signed the Declaration of Independence. End of geography-history lesson.

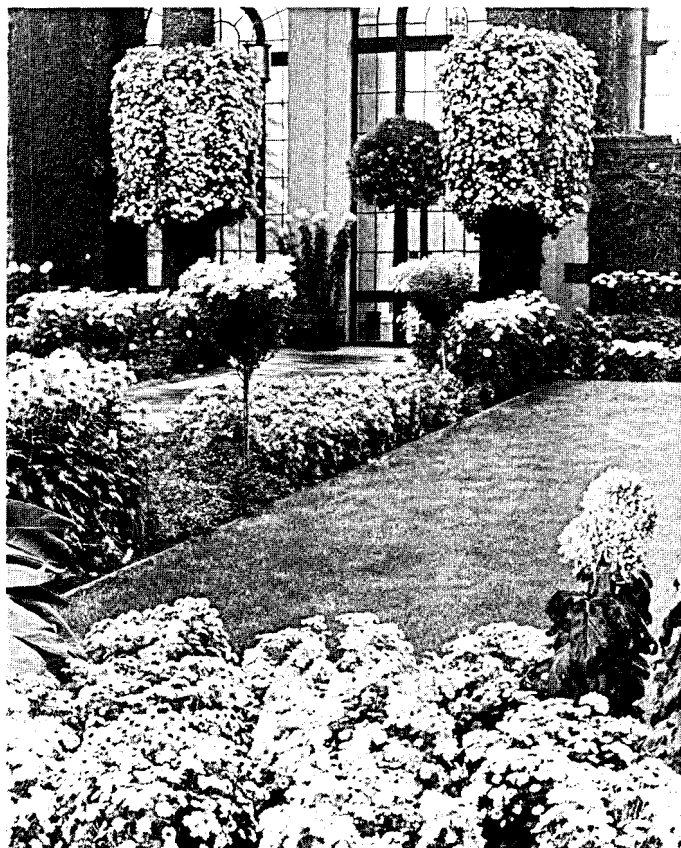
E. I. du Pont produced not only a profitable business but a string of renowned descendants, among them Pierre S. and Henry F. du Pont, great-grandsons. The first is responsible for the gardens and conservatories of Longwood; the second for the gardens of Winterthur, plus its museum of American antiques. Their common bond, besides blood, may be attributed to a love of trees.

Pierre S. du Pont (1870-1954) was born with the industrial proclivity which earned him the resources wherewith to indulge his hobby: preserving nature and turning farms into parks. The Quaker family Peirce had farmed a land grant from William Penn and built a home in 1730 near the present town of Kennett Square. About the year 1800 they started an arboretum consisting of extrinsic as well as indigenous trees. Their friends and neighbors were so cordially welcomed to the place to enjoy the grove that

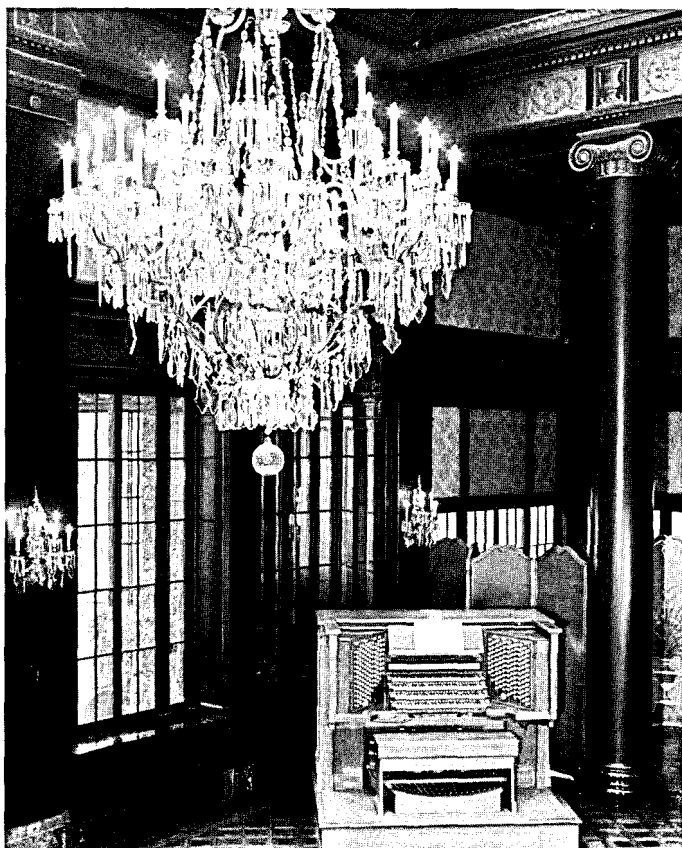
it became known as Peirce's Park. By 1906 hard times had befallen the family; the trees were about to be sacrificed. To save them from the ax, in stepped Pierre du Pont, and the conversion of Peirce's Park into Longwood Gardens began then and there.

Although the original house had been enlarged three times, the new owner erected in 1914 a separate addition matching the existing house and tied the two together by means of a conservatory.

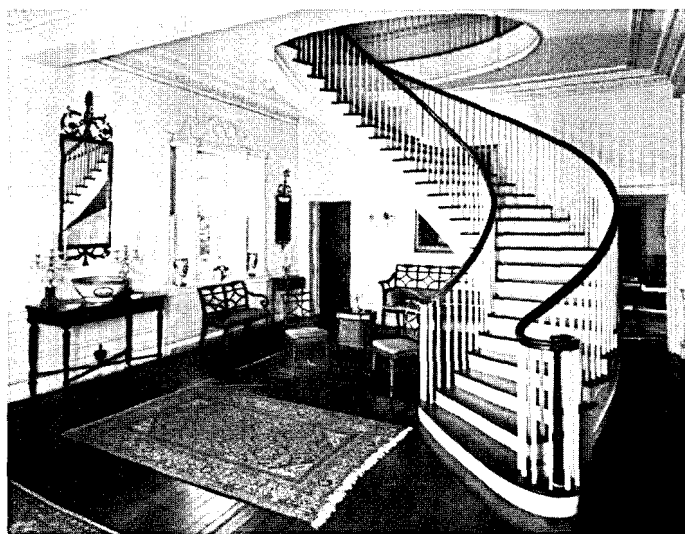
This was the predecessor of today's tremendous conservatories covering four acres. Heated or cooled as season demands, one peregrinates now under towering glass domes through pleasant gardens irrespective of weather on paved walks, bordered by flowers changed in season to provide unending color. Grass is always a rich green. Trees blossom and fruit. Pools sparkle and fountains play. Here is home for tall camellias; there for azaleas. In turn come acacias, bananas, hibiscus, orchids, you name it. In October, the chief color bearer will be the chrysanthemum throughout the conservatories and in the adjoining ballroom



Chrysanthemum Display in the Conservatories at Longwood Gardens. These will be ablaze with tens of thousands of chrysanthemums during our convention at Longwood. (Photo Courtesy of Longwood Gardens.)



Organ Console and one of the Crystal Chandeliers in the ballroom at Longwood Gardens. Calvin Randall will play a short concert on this organ. (Photo Courtesy of Longwood Gardens.)



One of the most impressive rooms of Winterthur's nearly 200 settings is the Montmorenci stair hall. Original portions of the stair were brought to Winterthur from Montmorenci, a socially prominent house built c.1822 in Shocco Springs near Warrington, North Carolina. Probably built by a North Carolina craftsman, much of the staircase had deteriorated to the extent that Winterthur craftsmen had to rebuild portions, reinforcing it with steel to accommodate local building codes. The total affect is a magnificent portrayal of the excellent craftsmanship of early American artisans. (Photo Courtesy of Winterthur Museum and Gardens.)



One of the best examples at Winterthur of Colonial America's taste for Chinese ornamentation is the Japanned maple and white-pine high chest of drawers made by Joshua Pimm of Boston around 1745. It is displayed here in the Readbourne Parlor. The paneling in the room is the original from Readbourne built c.1733 near Centerville, Queen Ann County, Maryland. (Photo Courtesy of Winterthur Museum and Gardens.)

where our closing banquet will take place.

Longwood began collecting camellias right after World War I when shipments of 70 *C. japonica* cultivars arrived from Belgium and France. Eight or 10 years later 116 plants including 3 *C. reticulatas* were acquired from Guichard Sisters of Nantes, France. A 1937 inventory recorded 372 plants representing 167 varieties. The first sasanquas arrived after World War II. The exact number of camellias alive in the collection today is not available at this printing, but some are of great age and size. Assurance has been given that camellia blooms will be in evidence in late October this year, whether on early blooming cultivars or by chemical treatment.

The outdoor gardens cover 350 acres threaded by 23 miles of paths. A wheelchair route is clearly marked. It takes the spectator from the Information Center to the main conservatory, past the five-acre fountain garden, topiary garden, rock garden, chimes tower and waterfall, oak and conifer knolls, and rose garden; for a longer ride it proceeds up to the Peirce-du Pont house, Peirce's Park, Flower Garden Walk (the initial undertaking of Mr. du Pont in 1907), the Italian water garden, the lake, wisteria garden, peony garden, and past the rose arbor back to

the Information Center, where rest rooms are found (in addition to those at the main conservatory). An extensive "idea garden" offers many suggestions for raising flowers, fruits, herbs and vegetables in home gardens.

Ten score full-time employees and many part-timers are required for the operation of Longwood Gardens, whose Director is Everitt Miller, the Northeastern States Director for the American Camellia Society. An annual budget of \$7,000,000 is supplied 70% by an endowment fund bequeathed by Pierre du Pont and 30% by gate fees and gift shop sales.

From Longwood a 10-minute bus drive crosses the State boundary to Winterthur in Delaware, the estate inherited in 1927 by Henry F. du Pont (1880-1967). The land was originally part of the 1,000 acres acquired by the immigrant great-granddad, E. I. du Pont. A slight detour from straight-line descent is interesting; it explains how it came to be called Winterthur by a Winterthurist — begging pardon — Winterthurian.

J. A. Bidermann immigrated in 1814, went to work at the du Pont powder factory, and married the boss' daughter. In 1837, contemplating retirement and the life of a country gentleman, he bought a large slice of the du Pont tract

and named it Winterthur in honor of the Bidermann's ancestral city in Switzerland. The Bidermann son, after the death of his parents, sold the property back to the du Ponts.

Henry F. du Pont was a naturalist from youth, having been born at Winterthur. By the age of 20 he was naturalizing spring bulbs in the forested hills and open windswept meadows. Then he collected and planted azaleas and rhododendrons, and turned an old quarry and some tennis and croquet courts into gardens. He brought in hundreds of new types of plants and is largely responsible for the current appearance of the rambling garden area. People who like a daily stretch will enjoy a good stroll through at least some of the 2½ miles of paths with sunshine brightening the red, yellow and gold of autumn foliage and the crimson, blue and black of the berries. Getting lost on such a tour can be avoided by having map in hand. It also helps in locating the largest oak, red cedar, sycamore or magnolia tree.

If outdoor horticulture was Henry du Pont's vocation, what did he do in bad weather? He was not one to sit and sulk. He had an indoor vocation; he collected decorative arts. This is a term which he would tell you, and show you, covers both the structural character of rooms and the

proper objects to adorn them. He revelled in the details of ceilings and floors, mantels and panelling, cornices, chair rails and windows. He particularly liked to discover fine homes in dilapidated condition or about to be destroyed and saving them for posterity by moving them to Winterthur and restoring them. If this were impossible, he would duplicate them, as he did the freestanding spiral stairway from Montmorenci, a Carolina colonial mansion. To furnish the rooms in the proper style, he collected period furniture, upholstery, wall-paper, paintings, glass, ceramics, metalware and bric-a-brac. There are more than 100 completely furnished 17th to 19th century rooms in the 1839 original Bidermann Greek-revival house as now surrounded by additions.

People whose hands cultivate a thing as pulsating with life as camellias might disdain something as inanimate as decorative arts. Nevertheless, ACS members who attended the 1982 fall meeting were almost unanimous in declaring that the real highlight was their visit to the Diplomatic Reception Rooms of the Department of State in Washington with its splendid display of beautiful historic antiques.

No matter the form in which beauty is found, it seems to be appreciated by persons of many divergent interests and leanings. Thus our delegates to this fall's meeting may count on an equally en-

thralling visit to the Winterthur Museum, which many of the 150,000 annual visitors say possesses the largest and finest assemblage of early American decorative arts in existence.

A Saturday afternoon visit is planned to the Hagley Museum which takes its name from the Hagley Cotton Mill, constructed in 1814 by E. I. du Pont, in the same compound with his 1803 house, "Eleutherian Mills," on a steep hillside above 21 black powder mills (now in ruins) beside the Brandywine River. Here too is the Du Pont Company's first office building (1837). Prior thereto, all business was conducted in the home. The compound is now owned by a non-profit educational institution designed to preserve a notable industrial site and relate its development to the nation's industrial progress.

On Your Own at Chadds Ford

You never dreamed you'd be going to an ACS meeting in Pennsylvania, so how much more delightfully surprised will you be to find yourself at Chadds Ford before or after the meeting with some spare time on your hands to look at the alluring countryside roundabout!

Throw a stone, follow it, and you'll be at the restored mill which now houses the works of the famous Brandywine school of artists. You don't have to be a connoisseur of art to click with the paintings in this gallery. N. C. Wyeth, his son An-

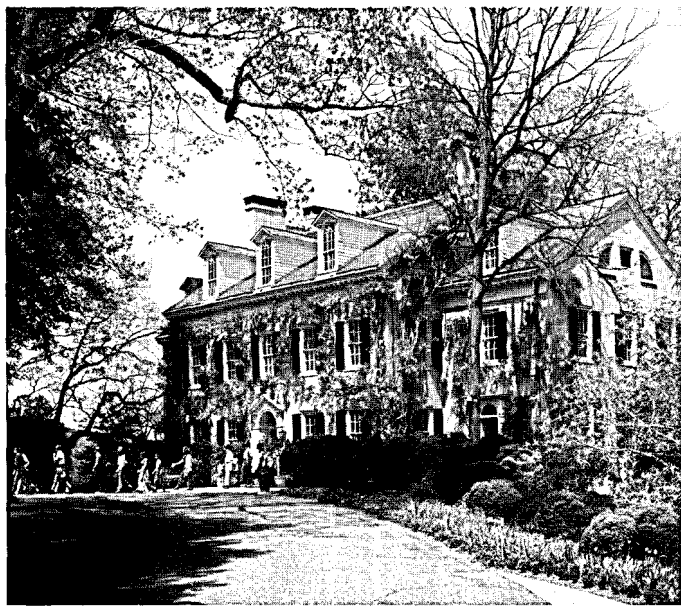
drew and grandson James have transmitted to canvas for future generations almost photographically what each of their generations saw around Chadds Ford.

Called the Brandywine River Museum, it could well have been named the Pyle-Wyeth. Howard Pyle was a great illustrator and the founder of the local school of artists. The family talent so widely recognized in the three Wyeths mentioned has spread further by consanguinity and by marriage, and the best of their works are displayed here too. Don't let an admission fee deny you an investment that will pay dividends in current pleasure and happy recollection.

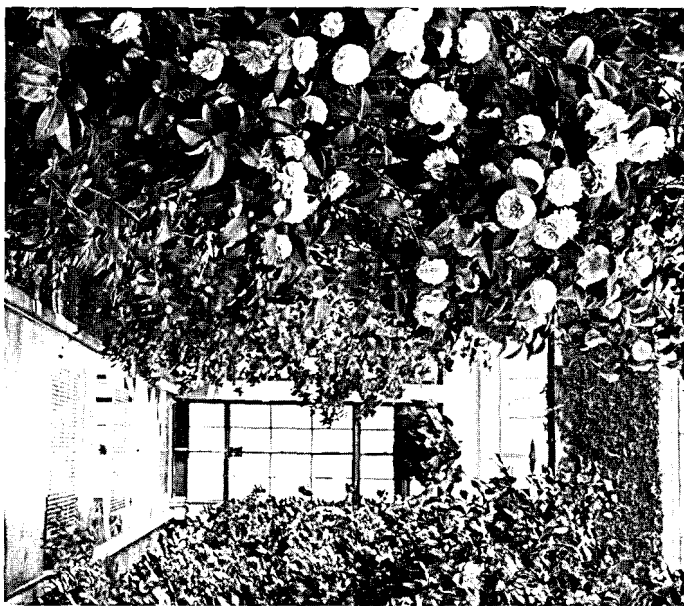
There is no charge to use the nature trail along the Creek. From markers along the way one recognizes trees, animals and birds inhabiting an idyllic landscape. A 20-minute walk ends at the 240-year-old house of John Chadd.

Admission is also free to the Brandywine Battlefield Park. Washington and Lafayette's headquarters are modest dwellings functionally furnished. What more would leaders of a volunteer army in those days require? Being a marquis, Lafayette needed a carriage, and behold, it is there today. So is the Conestoga wagon of pioneer times.

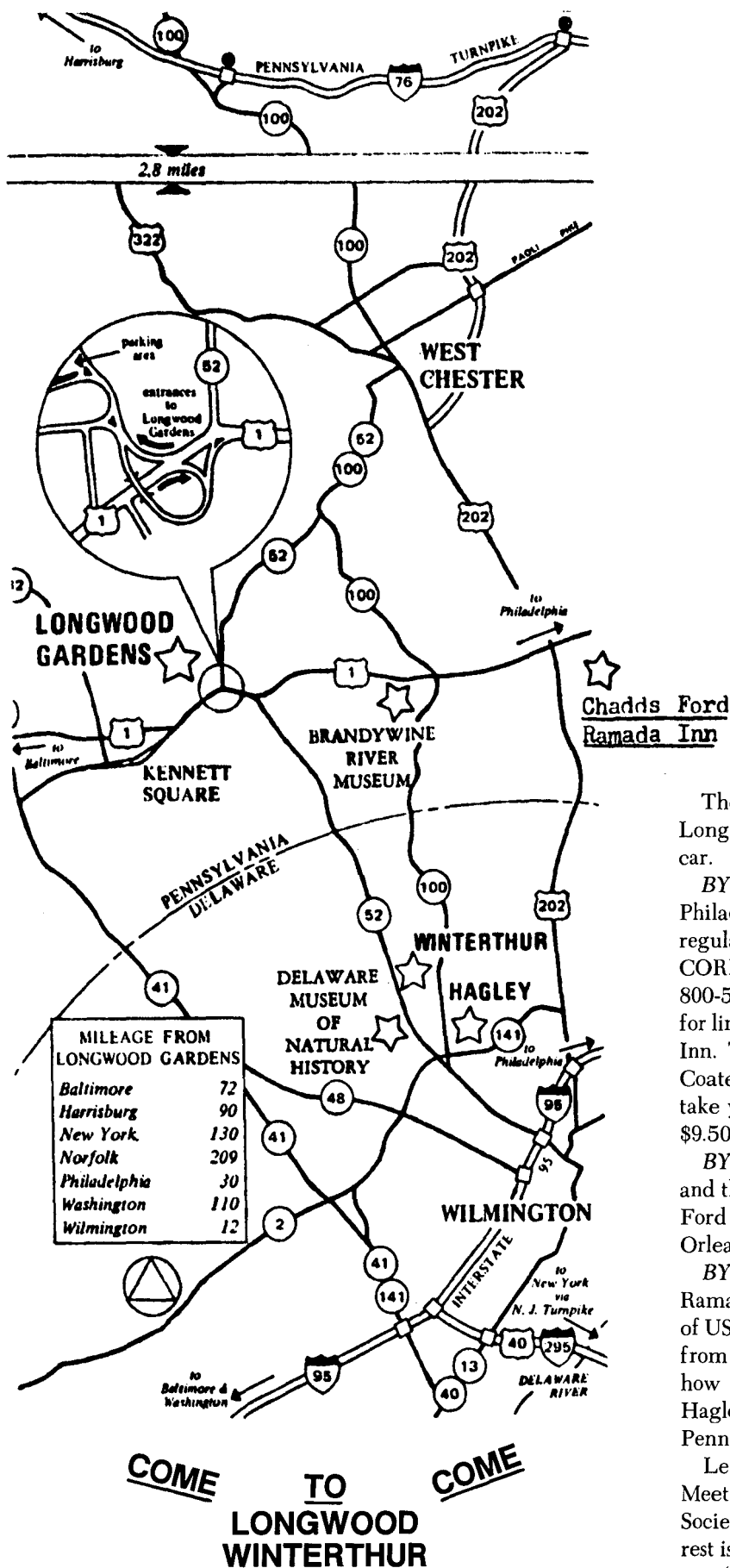
To go further afield in this charming area, you will want an automobile. Here with the approximate mileage from Chadds Ford are some interesting spots:



Eleutherian Mills, the 1803 Georgian country home built for Eleuthere Irenee du Pont, founder of the 19th century black powder milling community that is now the Hagley Museum. (Photo Courtesy of Hagley Museum.)



The Camellia Passage in one of the Conservatories at Longwood Gardens. (Photo Courtesy of Longwood Gardens.)



- 8 Kennett Square — "mushroom capital of the world" — see them grow.
- 10 Delaware Museum of Natural History — opposite Winterthur gate.
- 25 New Castle DE — attractive colonial town.
- 30 Valley Forge National Historic Park, PA.
- 35 Odessa DE — Corbit-Sharp house (1772) — owned by Winterthur.
- 40 Hopewell Village Nat. Historic Site, PA (1770) — iron furnaces supplied cannon and shot to Revolutionary Army.
- 50 Ephrata PA — Original (1732) cloisters of German religious sect.
- 50 Lancaster PA — center of Penn-Dutch and Amish country.
- 75 Hershey PA — chocolate manufacture and park.
- 75 Atlantic City NJ — Las Vegas of the East.
- 75 Baltimore MD — Nat. Aquarium and other attractions.
- 95 Annapolis MD — "Crab Town" — U.S. Naval Academy — colonial buildings.
- 110 Washington DC — 'Nuff said.
- 110 Gettysburg PA — Cyclorama — decisive battle of Civil War (1863).
- 135 New York City — Whatever you want.
- 209 Norfolk VA — Another camellia center.
- 860 Historic Massee Lane, GA.

— ACS —

How Do We Get there?

The convention sites for the Fall ACS Meeting at Longwood/Winterthur are easily reached by air, train or car.

BY AIR: You can take any of the major airlines into the Philadelphia Airport. The most reasonable airfares on regularly-scheduled airlines can be obtained from AIR-CORP. See their ad in this issue and use the toll-free line 800-526-0110. You will want to *make prior reservations* for limo service from the airport to Chadds Ford Ramada Inn. The Royal Limo Co., P. O. Box 151, Caln Road, Coatesville, PA 19320 (telephone (215) 384-5466) will take you directly to Chadds Ford Ramada Inn for only \$9.50 per person.

BY TRAIN: Ride AMTRAK to Wilmington, Delaware and then take a taxi the approximate 12 miles to Chadds Ford Ramada Inn. The Silver Crescent goes from New Orleans through camellia country to Wilmington.

BY CAR: From the map you can see that Chadds Ford Ramada Inn is readily accessible — it is at the crossroads of US 202 and US 1 — two major highways. Interstate 95 from the South and North has exits on US 202. You can see how close by are Longwood Gardens, Winterthur and Hagley. From the West you can come east along the Pennsylvania Turnpike and exit south on US 202.

Let's all come and make this the largest Annual Fall Meeting in the long history of The American Camellia Society. We guarantee you a most wonderful time; the rest is up to you. Since it is southern Pennsylvania we can say, "Y'all cum, heah!"

Guest Speakers at Conference

Speakers for the Educational and Horticultural Sessions are noted in their fields. Dr. Everitt Miller will give an illustrated talk on the Heritage of Longwood Gardens; Dr. Gordon Jones, Director of Planting Fields Arboretum, will talk about what is probably the largest indoor collection of camellias and about the introduction of *C. reticulata*, 'Captain Rawes', the first of the species in the United States; Dr. Kenneth Torres, a professor at Louisiana will talk on the latest data on tissue culture of camellias; Walter Wheeler, President of the New England Camellia Society will tell us about camellias in the area of the earliest camellia shows; Barry Yinger, Curator of the Asian Collection at the U. S. National Arboretum will talk about his plant collecting in and near Korea and what he has done with the prospective cold hardy camellia material he gathered while there. The talks will all be in the comfortable auditorium at Longwood Gardens.



The Garden at Eleutherian Mills bordered with dwarf fruit trees trained "en quenouille" (to grow horizontally). The garden with its parterres and intersecting paths reflect a French influence. From 1968 to 1972, the Museum restored the garden to its period of cultivation, 1803-1804. (Photo Courtesy of The Hagley Museum.)

(Continued from page 23)

stock. Especially keep rooting cuttings and seedlings well elevated and separated from older plants.

8. Clean holding area surfaces such as benches between uses; consider periodic treatment with a copper fungicide or a copper-based, suitable, nonphytotoxic wood treatment compound. Follow the label directions carefully.
9. Control snails and slugs.
10. Discard plants already seriously damaged by root rot; remember to discard also the infested planting mix. Thoroughly clean and disinfest containers before reuse. Remember that old infected plants increase the resident population of *Phytophthora* and thereby support the increased spread and incidence of the disease.
11. If an old, sick plant must be kept, bareroot it at an appropriate time; trim off the diseased

portions of the root system and shape and reduce the top of the plant; discard the old mix; replant in a clean container with new mix; give the plant a protective drench with a suitable fungicide (Subdue has shown suitability for this kind of application; check the label for uses and directions); and keep the plant in a low-stress area until reestablishment. Take care not to overpot, since the root system will be limited (see Point 6, above).

12. Organize plants for efficient watering and design your care program to ensure proper watering and minimization of stress. Moisture stress weakens plants and increases susceptibility or proneness to root rot.
13. Insist on strict sanitary conditions and concentrated control measures in propagation and in the early liner or pot stages. In the field, plants in many areas will eventually be exposed to *Phytophthora*. Delay of this exposure for as long as possible is beneficial.
14. Inspect plant material (top and roots) before

you buy it or bring it into your garden or nursery. Some people bareroot and replant (see Point 11, above) all additions to their collections. Nurserymen usually cannot do this, and in their case, protective chemical drenches (check with source nursery for previous treatment record to avoid overdoses or complications) may be in order upon receipt of stock. Employ all appropriate integrated controls. Where possible, keep "imported" stock away from your clean plants, especially your propagation areas.

In the future we may be able to employ yet another potent force for disease management: biological control. The nurturing and/or addition to soils of microorganisms antagonistic to *Phytophthora* and its disease-causing activities may bring about an effective, inexpensive control of disease! Before biological controls can be used, however, more research on antagonistic organisms and phenomena will be needed; we will have to learn how to best deploy and manage or nurture antagonists in soils or container mixes; and we must learn how to integrate biological, cultural, and chemical controls. By all indications, however, biological control agents do exist and are well within our grasp. We can look forward to significant developments in this area in years to come. When you think about it, the use of resistant or tolerant rootstocks is a type of biological control already in use.

Next time you set out to combat *Phytophthora* in your garden or nursery, do a more effective, thorough, and lasting job — employ the principles of integrated crop and disease management.

REFERENCES

- Rands, R. D. 1922. Streepkanker van kaneel, veroorzaakt, door *Phytophthora cinnamomi* n. sp. Meded. Inst. Plantenziekt. 54:41.
- Staub, T. H., and T. R. Young. 1980. Fungitoxicity of Metalaxyl against *Phytophthora parasitica* var. *nicotianae*. Phytopathology 70:797-801.
- Zentmyer, G. A. 1980. *Phytophthora cinnamomi* and the diseases it causes. Monograph No. 10.

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The American Phytopathological Society, St. Paul, Minn. 96p.
Zentmyer, G. A., and F. B. Guillemet. 1981. Evidence for strains of *Phytophthora cinnamomi*. Plant Disease 65:474-477.

—ACS—

NOMINATION & ELECTION OF DIRECTORS FOR PACIFIC COAST TERRITORY

After waiting until June 30th, as stated in the article "Nominations for Directors for Pacific Coast Territory" on page 19 of the May issue of "The Camellia Journal," we print herewith the nominations for the Directors. No individual or club or society forwarded any other nominations either to the Nominating Committee Chairman or to Headquarters.

Following is the report of nominations presented by the Chairman of the Nominating Committee, "Chick" (Mrs. Har- old) Rambath.

DIRECTORS-AT-LARGE

William D. Stewart, Sacramento, California, incumbent.

T. R. (Ron) Kellogg, Modesto, California, nominated to replace Vera Parker who is completing her second term.

STATE DIRECTORS

CALIFORNIA:

Mrs. Charles F. O'Malley, Woodside, CA, incumbent.

WASHINGTON/OREGON:

F. Cooper Ratliff, Lacey, WA, incumbent.

Since all candidates are unopposed, they are, then, actually re-elected or elected to take office when the ACS meets in Orlando next January. Their election will be verified by the Governing Board of the ACS at its meeting in Longwood this fall.

We wish to thank the Committee headed by Mrs. Rambath and composed of Wilbur Ray, Fresno, California; Robert Ehrhart, Walnut Creek, California and Edward M. Lewis, Bellevue, Washington.

We look forward to seeing all of these Officers at the meeting in Longwood in October.

FUTURE MEETINGS OF THE ACS

October 27-30, 1983 Hqrs. Ramada Inn, Chadd's Ford Kennett Square, PA/
Wilmington, DE
January 11-14, 1984 Hqrs. Langford Hotel, Winter Park, FL . . Orlando, FL
November 8-10, 1984 Hqrs. Holiday Inn, Perry, GA Perry/Fort Valley, GA
January 1985, exact date to be determined Mobile, AL
November 1985, exact date to be determined Houston, TX
April 3-6, 1986 Norfolk, VA

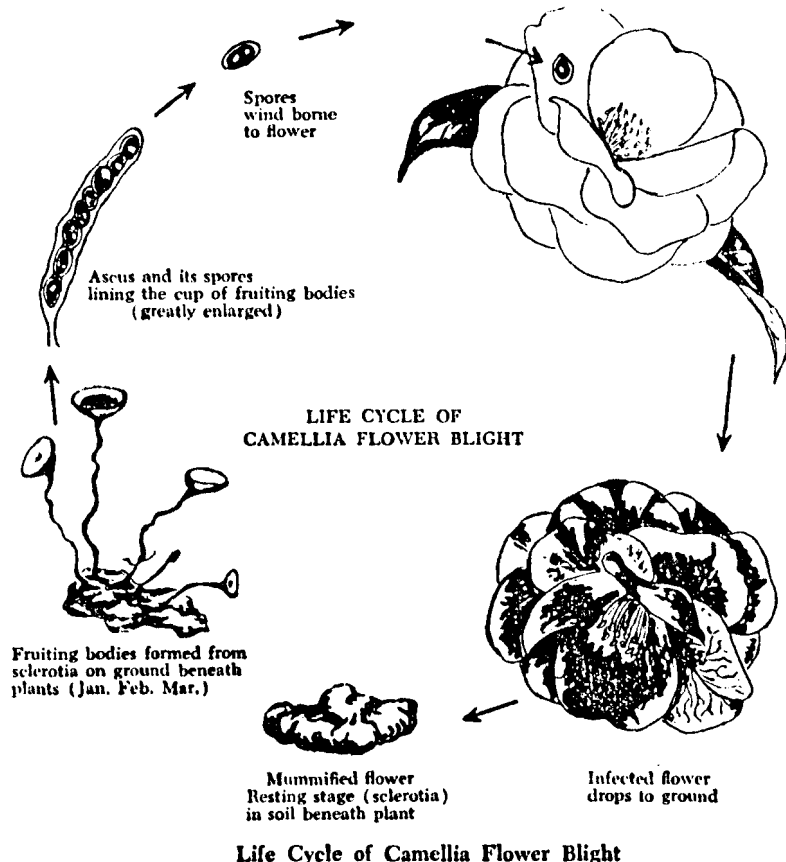
—ACS—

Show Dates

(ACS Cooperative Shows)

Place, Location, Sponsor	Date
Chadds Ford, PA, Ramada Inn, American Camellia Society in conjunction with ACS 34th Annual Fall Meeting (See details in this issue)	October 27, 1983
Gainesville, FL, Oaks Mall, 6419 Newberry Road, Gainesville Camellia Society	October 29, 1983
Greenwood, SC, Crosscreek Mall, West Carolina Camellia Society	October 29, 1983
Fresno, CA, Camellia-Rama, Smuggler's Inn, Central California Camellia Society	November 5, 1983
Greenville, AL, Greenville Camellia Society*	November 5-6, 1983
Savannah, GA, Men's Garden Club of Savannah	November 5-6, 1983
Charleston, SC, Magnolia Plantation & Gardens, 1st Annual Camellia Festival	November 6, 1983
Hattiesburg, MS, Cloverleaf Mall, Hattiesburg Area Camellia Society	November 12, 1983
Fort Valley, GA, Massee Lane, Middle Georgia Camellia Society	November 12-13, 1983
Jacksonville Beach, FL, Flag Pavillion, Island of Beaches Camellia Society	November 18-20, 1983
Beaumont, TX, Parkdale Mall, Southeast Texas Camellia Society	November 19, 1983
Gulfport, MS, Harrison County Courthouse, Gulfport Area Camellia Society	November 19-20, 1983
Valdosta, GA, Valdosta Camellia Society	November 19-20, 1983
Charleston, SC, First Federal Savings & Loan Assn., 34 Broad Street, Coastal Carolina Camellia Society & First Federal Savings & Loan	November 19-20, 1983
Gulfport, MS, Harrison County Courthouse, Gulfport Area Camellia Society	November 19-20, 1983
Fort Walton Beach, FL, Atrium of Westwood Retirement Center, Fort Walton Camellia Society	November 26, 1983
Slidell, LA, Municipal Auditorium, Ozone Camellia Club	December 3-4, 1983
Brookhaven, MS, Main Office of Brookhaven Bank & Trust Co., Brookhaven Camellia Society	December 3-4, 1983
Jacksonville, FL, Regency Square, Camellia Society of North Florida	December 3-4, 1983
Houston, TX, Houston Garden Center in Herman Park, Houston Camellia Society	December 3-4, 1983
Panama City, FL, Panama City Mall, Panama City Camellia Society	January 7-8, 1984
Baton Rouge, LA, Louisiana National Bank Building, Baton Rouge Camellia Society	January 7-8, 1984
Orlando, FL, Leu Gardens, Camellia Society of Central Florida (In conjunction with 39th Annual ACS Convention)	January 14-15, 1984
Pensacola, FL, Men's Camellia Club, Inc.	January 14-15, 1984
Ruston, LA, Holiday Inn, Ruston Men's Camellia Society	January 14-15, 1984
Dallas, TX, Valley View Mall, Texas Camellia Society	January 21, 1984
Aiken, SC, Kennedy Middle School, Aiken Camellia Club	January 21-22, 1984
Ocala, FL, Paddock Mall, Ocala Camellia Society	January 21-22, 1984
New Orleans, LA,	January 28, 1984
Charleston, SC, Citadel Mall, Coastal Carolina Camellia Society & Citadel Mall	January 28-29, 1984
Fort Walton Beach, FL, Santa Rosa Mall, Fort Walton Camellia Society	January 28-29, 1984
Shreveport, LA, R. S. Barnwell Art Center, Shreveport Camellia Society	January 28-29, 1984
Tuscaloosa, AL, West Alabama Camellia Club, Inc.	January 28-29, 1984
Lakeland, FL, First Federal Florida, First Federal Florida	February 4-5, 1984
Jackson, MS, Plaza of Walter Sillers Building, Jackson Camellia Society	February 4-5, 1984
Redwood City, CA, Community Activities Building, Peninsula Camellia Society	February 11, 1984
Birmingham, AL, Eastwood Mall, Birmingham Camellia Society, Inc.	February 11-12, 1984
Tyler, TX, Tyler Camellia Club	February 12, 1984
Monroe, LA, Downtown Central Bank, Northeast Louisiana Camellia Club	February 18-19, 1984
Fort Worth, TX, Fort Worth Botanical Garden Center, Fort Worth Camellia Society, Inc.	February 19, 1984
Waycross, GA, First National Bank, Federated Garden Clubs of Waycross & First National Bank	February 22-23, 1984
Wilmington, NC, Independence Mall, Tidewater Camellia Club	February 25, 1984
Fayetteville, NC, Cross Creek Mall, Fayetteville Camellia Club	March 3-4, 1984
Nashville, TN, Tennessee Botanical Gardens at Cheekwood, Middle Tennessee Camellia Society	March 3-4, 1984
Fresno, CA, Fashion Fair Mall, Central California Camellia Society	March 10-11, 1984
Fort Valley, GA, Massee Lane, Middle Georgia Camellia Society (In conjunction with the 35th Annual Fall Meeting of the ACS)	November 10-11, 1984

* Change since May Journal.



Life Cycle of Camellia Flower Blight

Camellia Flower Blight — What Is It?

MILTON H. BROWN

Camellia petal blight, also known as camellia flower blight, is actually caused by the fungus, *Ciborinia camelliae* (Kohn).^{*} This fungus is a close relative of the organism causing such diseases as brown rot of peaches and petal blight of azaleas. Although related, these three different fungi do not cause the blight on the other plants: for example, *C. camelliae* (Kohn) does not infest peaches; nor does its relative, *Monilia fructicola*, the peach brown rot fungus, infest camellias; nor does its other relative, the azalea petal blight organism, *Ovulinia azalea*, affect either peaches or camellias. Therefore, any control for one does not affect control of the others.

The disease was first described in 1919 in an obscure Japanese journal but was

not noted in this country until an isolated case was found in central California in 1938. No uniform control measures could be established between the several states and individual growers either unknowingly or unmindful of the dangers of spreading the disease, continued to obtain plants from infected areas and in less than twenty years it spread from California to all camellia growing areas. Leading nurseries in infected areas very early on took it upon themselves to ship plants bare rooted. Many nurseries, to this day, continue this practice.

As the name implies, camellia petal blight affects only the blossoms. It in no way attacks the plants. Even the bracts and ovary which comprise parts of the flower seem not to be attacked. All camellia varieties and species that are in bloom during the season of the blight appear to be susceptible.

The cause of camellia flower blight is the fungus, *Sclerotinia camelliae* Hara. Infected flowers are invaded by the fungus and food reserves from the flower

are transformed by the fungus into a specialized structure called a *Sclerotium* which forms at the base of the flower.

As we look at the *Life Cycle of Camellia Flower Blight*, it is like trying to argue which comes first: the chicken or the egg ... the infected flower or the wind-blown spores. For the sake of logic, however, let us begin with the wind-blown spore landing on a petal of a healthy bloom. Initially, if the weather and humidity are compatible for the growth and spread of the blight, one or two small brown spots will soon multiply to many brown spots and in a day or two, actually, the infected flower will become almost totally brown and drop to the ground. The *Sclerotium*, which is hard and dark in color and varies in size up to that of a normal seed of a *Camellia japonica*, is formed within 15-30 days depending on temperature and moisture. Once it is formed and hardened, it appears to resist natural forces of nature and can survive for several years.

Continuing around the life cycle, you will notice little mushroom bodies; these are formed from the *Sclerotia* on the ground beneath the camellia plants from late December through March generally. These spore-bearing structures are known as *apothecia*. These *apothecia* are saucer shaped, fleshy, generally light tan in color and vary in size from 5 mm to 2 cm. When triggered by the weather or by movement near them, the spores are ejected into the air. Each one of these microscopic spores (about 1/2500 of an inch) is capable of beginning a full life cycle of this dreadful disease. (According to Dr. L. W. Baxter, Jr. a single *apothecium* may discharge millions of spores. A single large *Sclerotium* may bear one to twelve *apothecium*. Thus, he notes, the fungus is prolific). In the past it was generally felt that these spores could be transported a mile or less, yet in 1976 our ACS Headquarters at Massee Lane which is at least two miles distant from the nearest camellia plants, Fort Valley — five or six miles away, Marshallville — three miles away and Montezuma — fifteen miles distant experienced petal blight for the first time, simultaneously. Undoubtedly, the spore is capable of being carried for great distances.

The ideal conditions for the growth and spread of camellia flower blight is in

^{*} Formerly called *Sclerotinia camelliae* (Hara), see "Camellia Flower Blight Caused by *Ciborinia camelliae* (Kohn)", pp. 107-113, *American Camellia Yearbook* — 1981, By Dr. Luther W. Baxter, Jr. and Dr. William M. Epps.

a range of 50° to 60°F. with high humidity, as it usually is during the camellia blooming season. Dr. Baxter also points out that freezing the affected flowers for 4, 8, or 16 hours at 0°F. does not kill the fungus. Hence, growing camellias in areas where the temperatures regularly dips below 32°F. does nothing to assure that there will be no camellia petal blight. Many of us had thought this but had no scientific data to support us. I think that the examples of 1977 and 1981 when we had temperatures here in Middle Georgia as low as 5°F. and with several days of not getting above freezing will bear out the fact that the fungus in its form of *Sclerotia* and the *apothecia* will not be "frozen out"; the 1977 camellia season had as much petal blight as we had in our first season in 1976 when the temperature seldom got below 35°. The only difference we noted was that the petal blight showed up later — but also the blooms came out much later.

"How do I know if I have petal blight if I have a bloom with brown spots on it?" you might well ask. The first noticeable symptoms will be small brown spots on the petals. After a day or a few days the spots enlarge and cover entire petals and eventually most, or all, of the flower. When infected flowers are turned over and the bracts (the calyx) and core (pistyl) are removed, a whitish-gray ring of cottony fungus growth is usually prevalent. If you rub the infected brown spot between your fingers, the petal will disintegrate somewhat in a slimy mass. Cold injury, for example, can be distinguished from flower blight rather easily. Cold injury sustained by a bloom is usually brighter in color and generally restricted to the margins of the petals; flower blight on the other hand, always progresses toward the center of the flower. If you are in doubt about the identification of petal blight from the symptoms on the flower put the "suspicious" flower in a plastic bag; punch a couple of holes in the bag and enclose the top of the bag with a rubber band so that the high humidity can be maintained; store the bag at a cool room temperature for about two weeks. Examine the base of the flower at that time for the presence of the hard brown bodies of *Sclerotia*.

Camellia Flower Blight: Comments On The Fungus, Its Relatives and Its Control

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It was 45 years ago in February that H. N. Hansen and H. E. Thomas first found camellia flower blight in a nursery near Hayward, California. These University of California plant pathologists described the causal fungus, *Sclerotinia camelliae* Hara, and recorded the key features of its life history. They also suggested that the fungus was brought into the U.S. with camellias imported from Japan. Their prediction that "there is little danger of the disease becoming established in parks or private gardens," has since been proven wrong. Beginning about 1950, a succession of states began reporting the occurrence of the flower blight disease. Reports of blight were made from Oregon, Louisiana, Texas, North Carolina, Georgia, South Carolina, Mississippi and Florida. It is likely that the disease now occurs in all southern and southeastern states where camellias are grown.

Comments on the Fungus

Dr. Linda Kohn, in a 1979 monographic revision and study of the genus *Sclerotinia*, concluded that the Japanese camellia flower blight fungus and the American flower blight fungus belong to two different genera. The name of the American fungus was changed to *Ciborinia camelliae* Kohn because (1) the description by Hansen and Thomas did not follow nomenclatural rules (they failed to publish a Latin description of the fungus) and (2) host tissue occurs in the sclerotia of the American camellia fungus. Kohn limits the genus *Sclerotinia* to fungi whose sclerotial medulla are free of host tissue or whose sclerotia are formed free and above the agar surface in culture. Although taxonomic considerations do not bear directly on the problem of disease control, they do contribute to a better understanding of the biology and interrelationships of these fungi.

Relatives of the Camellia Blight Fungus

A symposium on *Sclerotinia* was presented by the American Phytopathological society (APS) in 1978 in which information on all known aspects of this important fungus was considered. A review of this information may help develop leads that can be applied specifically to *Sclerotinia camelliae* and flower blight control. The fungal genus *Sclerotinia* contains members that are major economic pathogens of many important crop and food plants. *Sclerotinia sclerotiorum*, one of the most successful plant pathogens, is known to attack over 300 different plant species. Methods of control for this fungus have had varying degrees of success and include the use of: (1) protectant chemicals, (2) materials that inhibit sclerotial germination, (3) cultural practices such as crop rotation (4) sanitation and (5) reduced irrigation. Methods still under investigation are use of resistant plant cultivars, modification of microclimate and use of sclerotial parasites or antagonists. Camellia blight control has employed many of the methods from the first list.

This APS symposium speaker, who addressed the problem of control of *Sclerotinia*-caused diseases, stated that "most diseases caused by *S. minor*, *S. sclerotiorum* and *S. trifoliorum* have not been controlled consistently and economically." This problem then, is not unique to the camellia grower; it is a problem common to growers of many important crops (vegetables, fruits, forages and cereals). More efficient and economical control of diseases caused by *Sclerotinia* species will likely be developed when we have a better understanding of the biology of the causal fungi and how various factors interact to increase or reduce their ability to cause disease.

Status of Camellia Flower Blight Control

The status of camellia flower blight control is similar to and reflective of the status of control of *Sclerotinia*-caused diseases. Specific control measures, such

as sanitation, which might be of value in isolated areas are of little value where camellias are common and blight is prevalent. Similar problems also apply to the use of chemical ground sprays or use of mulches. It is obvious that a successful control must be under the absolute direction of the individual grower.

The use of protective sprays on camellias was given little serious thought until the advent of systemic fungicides. This however, was probably false hope because modern fungicides still exert control mostly by protective action. The sensitivity of delicate flower tissues and unsightly residues was frequently cited as reasons for not exploring the use of flower sprays. It is my view that these problems were over-emphasized. Spray residues would probably be of concern only on show flowers.

I will briefly summarize the results of the protective flower-spray tests that I have conducted since 1976. I consider the spray control tests I have performed to be successful but by no means the final answer to blight control. Thirty percent blight is still an unacceptable amount of disease. Additionally, the number of fungicides tested has been quite small because of the time required to perform a test. It is hoped that more researchers will become interested in spray control tests now that there is some evidence of success. Bayleton, a chemical previously tested, received EPA registration in 1982 for use against camellia flower blight and should be available to the public.

Cumulative results from my tests, 1976 through 1983, show that 37% of the flowers became blighted on fungicide-sprayed plants (those treated with Bayleton, Baycor or Ornalin) while 68% of the flowers were blighted on the unsprayed control plants. These results came from checking a total of over 43,000 flowers. Flower blight was severe during the 1983 test season (now almost over). Ornalin-sprayed plants had 34% of their flowers blighted while 85% of the flowers were blighted on the control plants. Ornalin is marketed by Malinckrodt, Inc. and is currently approved by the EPA for disease control on many ornamental plants including azaleas and rhododendrons.

Disease pressure and blight incidence is cyclic during the camellia flowering

season because of temperature and moisture influences on fungus spore production. Fungicide-sprayed plants often have a high percentage of blight when disease pressure is great. It is therefore necessary to take periodic disease readings (every 2 to 3 days) during the flowering period, and then determine the average amount of blight, in order to get a true picture of disease control.

It is my belief that the future successful control of camellia flower blight will be closely tied to the successful control of other *Sclerotinia* - caused diseases. When a consistently successful and economical control is developed for lettuce drop and white mold of beans, both serious diseases caused by *Sclerotinia* species, it will likely have a direct bearing on successful control of camellia flower blight as well.

We, however, do not have to sit and wait for new developments. I would like to suggest two other approaches or modifications to blight control. The first is the possibility of combining a Terraclor (PCNB) ground spray with a Bayleton flower spray. The Terraclor spray would

prevent spore production beneath your plants and thus reduce overall disease pressure. Bayleton would be sprayed on the flowers to protect them from spores blown in from other properties. I suspect Bayleton might perform better under the above conditions than it has in my tests where disease pressure is often very high. Both the above materials are registered for use on camellias.

The second suggestion comes from analyzing the graph of daily flower blight percentages from my 1983 test. Daily blight percentages dropped steadily on sprayed plants from the beginning to less than 5% during the last 10 days of the test except for a 6 day period during mid-test. This did not occur on control plants where daily blight percentages remained high except for 7 days near the end of the test. This information suggests a possible cumulative (perhaps systemic) effect from spraying and the possibility that Ornalin sprays applied at least 2 weeks prior to the beginning of flowering might result in greater blight control throughout the entire flowering period.

—ACS—

Observations on Camellias

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A full-grown, mature sclerotium of *Ciborinia* (= *Sclerotinia*) *camelliae* (Fig. 1) was formed in an infected flower of *Camellia japonica* 'Marie Bracey' which was lodged in the crotch of two branches. This was a naturally occurring event at Clemson, SC, and a quick survey revealed other mature sclerotia of this fungus, the cause of camellia flower blight, formed on infected flowers lodged in crotches of cultivars such as 'Rev. John G. Drayton' and 'Roosevelt Blues.' All three of these cultivars are non-shattering types as opposed to free shattering types, such as 'Sawada's Dream.' Shattering types do not lodge in plant crotches.

Many probably have seen naturally affected camellia flowers (lodged in the plant's crotches) which have supported sclerotial development but this documents this phenomenon and provides in-

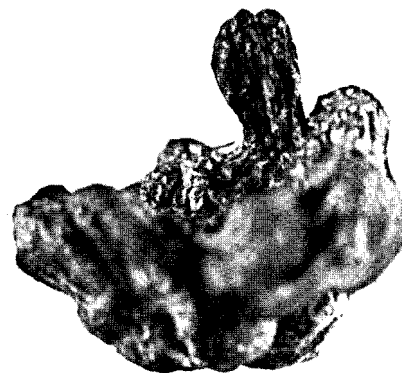


FIGURE 1. Mature sclerotium of *Ciborinia* (= *Sclerotinia*) *camelliae* formed on infected camellia flower lodged in crotch of two branches (*C. japonica* 'Marie Bracey').

formation for the beginner in Camelliology.

This year (1983) the weather, during April, was unusually wet and cool in the Southeast, favoring sclerotial develop-

ment. In addition, the spring of 1983 was a great year for camellia blossoms. There was an unusually long flowering period with several good flowers appearing as late as May, and incidentally, flower blight was prevalent on these late flowers. Thus, there were many opportunities for sclerotial development to occur.

When practicing sanitation for the control of flower blight, such as picking

up and destroying infected blossoms, it is necessary, based on this information, to survey the plant and find, remove, and destroy lodged flowers from the branch crotches along with flowers on the ground.

Appreciation is extended to Mr. James Martin of the Clemson University Communication Center for photograph (Fig. 1).

—ACS—

Dieback of Camellia Caused By *Glomerella Cingulata*

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Every plant has its problems from the time it is planted until it dies. A plant must be able to endure (1) the elements (cold, drought, wet tight soils, etc.), (2) competition from weeds, (3) plagues of insects, and (4) the ravages of disease. This article deals only with the disease aspect.

In order for a disease to occur, three things must be present: susceptible plants (number of plants and their relative susceptibility influence severity), proper environmental factors (that is, favorableness to disease, and duration of this favorable environment), and plant pathogens (their abundance and virulence affect the severity of disease development).

This discussion will be limited to the disease, camellia dieback, caused by the fungus, *Glomerella cingulata*. The name dieback is really not very descriptive for the term dieback means the following in plant pathology and horticulture: necrotic (dead) symptom of disease in which death of shoot tissues begins at the tip and progresses back toward the main stem. Graft failure (Fig. 1) and cutting failure, where infection occurs at the cut stem ends, may fit the dieback phase but typically, when infection occurs through fresh leafscars, a canker is formed. A canker is defined as follows: a necrotic symptom of disease in woody plant parts: the necrosis (death) is restricted to a definite area that is surrounded by callus (Fig. 2). However, since camellia dieback is the term that is so firmly entrenched in the literature and in the

mind of camellia enthusiasts, it will be used throughout this article.

History

The first definitive proof published that the fungus *Glomerella cingulata* (= *Gloeosporium* sp. = *Colletotrichum* sp.) is the cause of camellia dieback was presented by Post (1934) who isolated and grew it in culture. She (Ms. Post) isolated it from camellia dieback twigs from Savannah, Georgia, and then successfully inoculated susceptible camellia plants with a pure culture of it (the fungus that she isolated, grew and used as *Gloeosporium* sp., the asexual form of *Glomerella cingulata*). She did not mention whether or not the stems were wounded; but with successful infection it is almost a certainty that the stems of susceptible camellia cultivars were wounded. Davis & Pirone (1941) isolated and grew *Glomerella cingulata* in culture from camellia specimens from New Jersey, Ohio, Pennsylvania, and Texas. They specifically state that infection occurred on wounded camellia stems but not on non-wounded camellia stems. Bain (1946) repeated the results in Mississippi and confirmed that which Davis and Pirone had gotten in New Jersey. Later, Baxter & Plakidas (1953) found that infection occurred naturally through leaf scars or through any open wound such as those created at grafting time or those made by lawnmowers or cultivating implements. They also demonstrated that certain *Camellia japonica* cultivars were more resistant to dieback than others. Gill (1953)

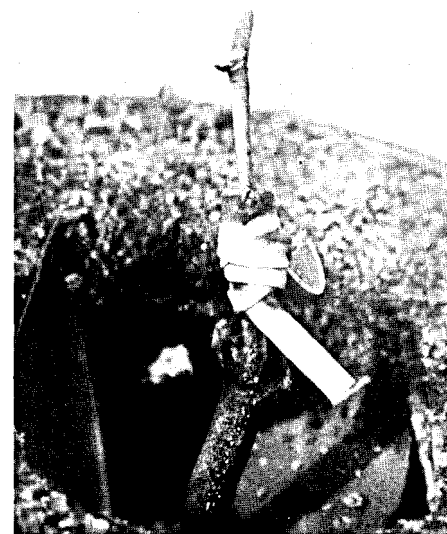


FIGURE 1. Graft failure



FIGURE 2. Canker surrounded by callus tissue

also got infection through wounds created by removing leaves. In his work he used primarily the cultivar 'Blood of China.' West (1946, 1948) in Florida, made a series of isolations from infected camellia stems but isolated two different fungi, *Gloeosporium* sp. and *Phomopsis* sp., but since he did not wound the stems he was not able to get a clear cut answer as to which fungus, if either, was the cause of the camellia stem disease. Apparently he considered *Phomopsis* sp. the more likely candidate since he called it *phomopsis* blight.

Miller and Baxter (1970) isolated a *Phomopsis* species from diseased azaleas which caused a serious dieback to all types of azaleas tested, but inoculations made later with this fungus onto *C. sasanqua* seedlings were not successful (Baxter, unpublished data). An entirely different *Phomopsis* species recently has been isolated from a diseased camellia stem by Baxter and Fagan (1982 unpublished data) but it did not infect seed-

lings of *Camellia sasanqua*. In short, Post (1934), Davis & Pirone (1941), Bain (1946), Gill (1953), and Baxter & Plakidas (1953) were all able to get infection of camellia by inoculating camellia stems through natural or artificial wounds with the fungus *Glomerella cingulata* (= *Gloeosporium* = *Colletotrichum*). *G. cingulata* is easy to isolate and grow in pure culture as revealed by Gill (1953) and Baxter & Plakidas (1953).

Gill (1953) found a *Gloeosporium* sp. to be present in apparently healthy camellia buds. From 4,644 bud scales studied, 173 yielded *Gloeosporium*, and a representative sample of these (10) were found to be pathogenic (caused infection) on various camellia cultivars. Gill (1953) states "Inoculations were made with ten isolates from leaf buds into 145 young twigs of four varieties ('Elegans,' 'Gigantea,' 'Margaret Higdon,' and 'Mathotiana'). Infection resulted in all varieties. Infection was also produced in 'Blood of China' ('Victor Emmanuel') by inoculation with the fungus from the bud scales." He further states "In small young shoots, dieback may develop without visible evidence of a wound. In others there is a suggestion that infection occurred through leaf scars." This last idea agrees with Baxter and Plakidas (1953). It is of interest that this same concept was presented in two separate articles by two separate and independent investigators at the same time in the same journal (1953 Amer. Camellia Yrbk.) back to back (Gill, 137-144; Baxter & Plakidas, 144-149).

In 1979 Baxter & Fagan isolated and grew in culture *G. cingulata* from flower buds which fell prematurely. Isolates of *G. cingulata* from these affected buds caused cankers on *C. sasanqua* seedlings when they were wound inoculated. This agrees in general with Gill's work (1953). Baxter, Witcher, & Fagan (1979) recovered pathogenic isolates of *G. cingulata* from vegetative buds of camellias in South Carolina since seedlings of *C. sasanqua*, when wound inoculated, become diseased.

From previous work it probably would be safe to state that *G. cingulata* spores can either lodge and remain viable on any of the above-ground parts of the plant, or the spores can invade certain tissues such as bud scales and very young

leaves (on which we have found it sporulating, Baxter & Fagan, unpublished information). It should be noted, however, that it either does not completely penetrate bark to the phloem and cambium or else it does not penetrate bark at all. I do not know of any work which has attempted to isolate *G. cingulata* from apparently healthy camellia bark, particularly from the camellia branch crotches.



FIGURE 3. Root rot and sparse foliage

Contagious versus noncontagious camellia dieback. Baxter, Can, and Fagan (1978) pointed out a problem associated with proper diagnosis which separated noncontagious from contagious dieback. Many camellia enthusiasts had gotten "control" of dieback by the application of various treatments that would not affect contagious dieback. With the exception of graft failure, caused by the fungus *G. cingulata*, plant stems affected by contagious dieback develop a canker that develops after twig blight. Infection occurring through lawnmower injuries (or injuries sustained by other factors) also develop cankers. Occasionally a cultivar is so susceptible to infection by *G. cingulata* that the entire branch dies before a canker can form, especially if the branch is only ¼ inch or less in diameter. In this case infection normally occurs through a new leaf scar and the young twig dies, turns black and dries up. If the affected twig is very young the leaves will usually fall off, leaving a bare stem; but, if the

leaves are more mature at the time of death of the twig, the leaves turn brown and hang on. The dead area at the base of the stem enlarges as the fungus continues to invade and kill more and more of the woody tissue. Normally this is where a canker would form, but the plant cannot form callus tissue if death occurs too quickly. Otherwise (and typically) a canker is formed at the base of a dead lateral stem (Fig. 2). Although lateral twigs commonly are killed by dieback, terminal twigs (in the absence of a dead lateral branch and/or canker) are seldom killed. This may be due to the absence of a lodging place for the spore so that it is not available at the time of leaf fall. Whatever the reason, the terminals are seldom killed except when the entire branch dies from the canker.

One of the major contributors of excessive leaf fall in *C. japonica* leading to sparse foliage is root rot (Fig. 3) caused by the soilborne fungus, *Phytophthora cinnamomi*. This fungus is serious on *Camellia japonica* but it does not seriously affect either *C. sasanqua* or *C. oleifera*. These latter two species are used as stock on which *C. japonica* scions are grafted which protects them from root rot.

Environmental Factors Favoring Infection of Camellias by Glomerella cingulata

The spores of the dieback fungus are spread both by splashing raindrops and crawling or flying insects. The spores are not wind-blown as are ascospores of the camellia flower blight organism and thus there is limited lateral movement of the fungus. Warm temperatures (20-25 C = 68-77 F), high humidity, and abundant rainfall favor sporulation and dissemination of the spores. Obviously there must be susceptible, infected camellias with cankers for sporulation to occur. The fungus can withstand high temperatures (35 C = 95 F) without being killed. Under laboratory conditions, dried spores can remain viable and virulent for at least one year. High humidity, as occurs in the Deep South, is favorable for the organism causing camellia dieback.

Control

A. *Exclusion of the pathogen:* In certain areas this disease apparently is of

little consequence such as in California and the eastern part of Virginia together with the Washington area. It is serious on camellias in greenhouses because of the high humidity and warm temperatures. The point — if you don't have the disease, don't bring it in. Use disease-free scions and stock for grafting and disease-free cuttings for rooting.

B. Eradication of the pathogen:

1. Keep the humidity low by
 - a. destruction of weeds under camellia plants
 - b. mulching outside camellia plants with pine straw or the equivalent;
 - c. not locating camellia plants in dense shade, such as under dogwood or oak trees; and
 - d. pruning camellias by thinning out (rather than heading back) by cutting out the weak branches which will allow air to circulate freely.
2. Cut out and destroy cankers when possible. (This is difficult when the canker is on the main stem.)
3. Soak scions and/or cuttings for 1 hour in benomyl suspension (1 tablespoonful per 2 gallons of water) before grafting or sticking.

C. Protection of the host: Spray plants with benomyl at 14-day intervals during leaf fall (which usually occurs at Clemson during late April, May,

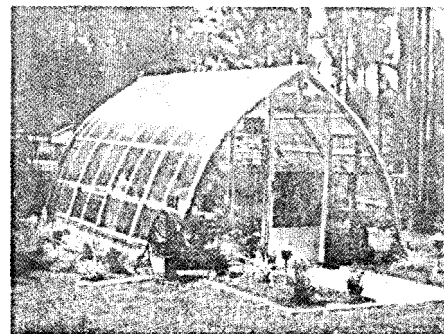
and early June); ventilate greenhouses properly to keep down humidity (protecting the plant by creating an environment unfavorable for the pathogen); space camellia plants for good airflow (protecting the plant by creating an environment unfavorable for the pathogen).

- D. Development of resistance in the host:** Certain *Camellia japonica* cultivars, such as 'Governor Mouton' and 'Professor C. S. Sargent,' are resistant to most strains of *G. cingulata*. Other camellia cultivars, undoubtedly, will be found soon.

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The newly refurbished greenhouse garden was literally abloom at Eastertime. Thanks to Jesse Harrell of Harrell's Nursery, Warner Robins, GA we had some 750 Easter lilies in bloom for a few weeks. The hanging ferns also added much to this solemn season in the greenhouse garden. Spencer Walden gave us these, plus two huge ones in the front of the garden in the greenhouse. We hope to have various blooming plants during the year when the camellias or azaleas, planted in the ground, are not in bloom. (Photo by C. Wilton Walton, courtesy of the Leader-Tribune, Fort Valley, GA)

8. Miller, Sharon B., and L. W. Baxter, Jr. 1970. Dieback in azaleas caused by *Phomopsis* species. Phytopathology 60:387-388.
9. Post, Thelma B. 1934. Dieback of camellia. U. S. Dept. Agric. Plant Dis. Repr. 18:112.
10. West, E. 1946. Camellia dieback. American Camellia Yearbook 1946:46-48.
11. West, E. 1948. More about camellia dieback. American Camellia Yearbook 1948:124-126.

Camellia Speedpod Gall¹

L. W. BAXTER, JR., W. WITCHER, AND SUSAN G. FAGAN²

Galls of *Camellia japonica* plants (Fig. 1) from the home of Robert B. Gramling, 1521 Old Fort Drive, Tallahassee, FL 32301 (accompanied by galls on camellias from the homes of George Clegg and Mrs. Nelson Carter — also from Tallahassee), were sent to Milton Brown, Executive Secretary of the American Camellia Society at Masee Lane. He then sent them to me (arrival date 5-2-83) for laboratory studies about the cause and nature of this problem.

Dr. Wesley Witcher, Susan G. Fagan, and I began work on them the same day by soaking one of the galls in water overnight (Fig. 2). The next day the soaked gall was cut crosswise and bits of the very tough outer rind were examined microscopically. The observations revealed that the problem was caused by a fungus belonging to the fungal class, Basidiomycetes. Four fungal spores with their four tiny stalks (sterigmata) arose from each basidium (equivalent to the ascus in the fungal class, Ascomycetes). We tentatively identified the causal fungus as a species of the genus, *Exobasidium*. This group of fungi typically produce leaf and stem gall of a large number of plants (*C. sasanqua* leaves, for example), and another species attacks other plant families producing a condition known as "rose bloom" which is an enlarged, immensely thickened flower.

The seed pods of camellias are capsules which are dry, dehiscent fruit (usually many seeded) composed of two or more carpels. For example, if one cuts an apple crosswise, fine carpels (divisions where the seed are formed) are visible. Since the word capsule is not widely used among camellia enthusiasts, we suggest that this disease be called **camellia seedpod gall**.

When the affected capsule was cut crosswise, the outer wall was tough and fleshy from which the basidia and basidiospores were produced. At this time of the year (early May), the developing cap-

sule is usually green and about ¼ inch or less in diameter. The enlarged, diseased, dry gall was approximately 1¼ inches long by 1 inch wide. The sepals were not affected, but on the gall that was soaked (measuring approximately 1½ by 1½ inches after soaking) a structure below the gall was interpreted as an affected petal (Fig. 2, lower right side). The dried gall was white and extensively wrinkled (Fig. 1). No developing embryos (seed) were found within the fleshy, enlarged capsule. The fungal saprophyte, *Pestalotia* sp., however, was fruiting prolifically on the soaked gall as was seen by microscopic examination.

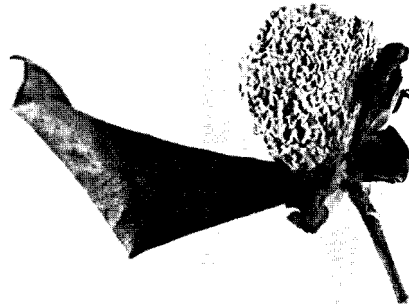


FIGURE 1. Camellia seedpod gall. Note extreme wrinkling and whitish color. Also note the unaffected sepals at the base.



FIGURE 2. Camellia seedpod gall after soaking in water overnight. The pod was cut crosswise. Note unaffected sepals at base but apparently one petal was affected, lower right.

At this time we do not know how widespread this disease is. For control, we recommend picking off and destroying the galls. Additional work is in progress.

I had this picture (Fig. 3) made of a gall on *Camellia japonica* (unknown cultivar) sent in by a person from Beaufort,

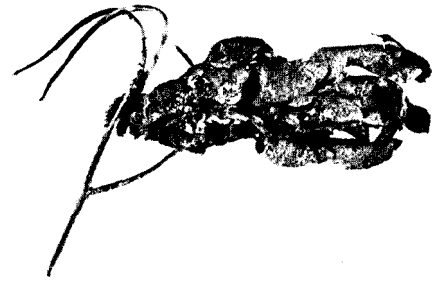


FIGURE 3. Gall on a seedpod of *C. japonica* from Beaufort, SC.

SC. The gall (and stem) are about natural size. It was not possible to straighten out the gall so it would show more precisely, but it was arising from a seedpod. The leaves which were new growth, fell off in transit. This gall was a monstrous-looking thing.

It is not reasonable to believe that a new disease would suddenly erupt at three separate locations as distant as Tallahassee, FL, Gainesville, FL, and Beaufort, SC. I'm wondering whether or not the year was such (long flowering season) that the weather favored the regular *Exobasidium* sp. that attacks camellia leaves, so that infection of the seedpod occurred by the fungus that causes leaf and stem gall on *C. japonica*. Of course, it is so striking that it would be noticed and, as such, it could have come in from a central location. In other words, if each of these people ordered a camellia plant (or plants) from Camelliaville, USA, it could have become distributed throughout by this method. After this is published, others may be on the lookout for it next year. Since April and May are the months for *Exobasidium*, we will not have an opportunity to find out much more this year.

(ED. NOTE: The discovery of this malady in several isolated places indicates that either the season just past was such that the fungus *Exobasidium* sp. was so favored that it has now attacked seed pods or perhaps this is a new, but related, fungus which may have been spread from a central source. Readers are asked to be on the alert this next season, especially around April and May for this disease and if found to photograph it and contact Dr. Baxter at Clemson University.)

¹ Contribution No. 2174, South Carolina Agricultural Experiment Station.

² Professors and Technician, respectively. Appreciation is expressed to Jim Martin for making and developing the pictures.

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HORTICULTURIST**

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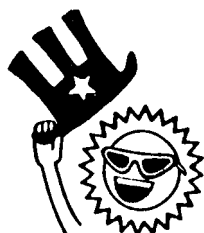
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November 12-13, 1983

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There will be equal awards for Grown-out-of-Doors and Under Glass; except for Best 'Ville de Nantes', Best White, Best Bloom Raised by a Member of The Middle Georgia Camellia Society, Best Bloom in Show and Best Bloom in Novice Class.

For Program Schedule, etc. contact Marvin Jernigan, 231 Raven Wood Way, Warner Robins, GA 31093

Telephone (912) 922-2300

*Artistic Arrangements Chairman: Mrs. John L. Hodges, 109 Carterwoods Drive,
Warner Robins, GA 31093 (912) 953-3459*

AWARDS for Artistic Arrangements, Sasanqua blooms, Reticulata and Retic Hybrids, and Non-Retic Hybrids will be made.

ARTISTIC ARRANGEMENTS (See May issue of *Camellia Journal*.) This will be a Standard Show as determined by The National Council of State Garden Clubs.

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Mr. Gene Nash (Husband of Monique Peer, Los Angeles, CA)
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—ACS—

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(Since May issue)

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 Dr. Asa Barnes
 Mr. G. Stuart Watson

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(Since May issue)

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 Mrs. Ralph Windsor
 Thomas A. Perkins, III
 Mr. & Mrs. H. D. Butler

One man 89 years of age, said he could not be committed for a long period of time. He sent in \$365.00 for ten years. We assured him that we would contact him in 1993!

Men's Camellia Club of Charlotte gift for horticulturist.

Special Gifts

(As of June 16, 1983)

Mr. and Mrs. Thomas C. Evans: Contributions honoring the wedding anniversaries of the Dan Nathans and Milton Browns and Dan Nathan's birthday
 Mr. and Mrs. Philip Ireland and Mr. and Mrs. Milton H. Brown: Contributions wishing a speedy recovery to William J. Sette
 Dr. J. I. McClurkin: Contribution to ACS
 Middle Georgia Camellia Society: Funds to purchase a new engine for heavy duty mower
 Mr. W. F. Freshwater: Twelve bird prints
 Harrell's Greenhouses and Nursery: Seven hundred Easter lilies
 Mr. and Mrs. Milton H. Brown: Contributions honoring the birthday of The Reverend Bonneau Dickson, the wedding anniversary of the Dan Nathans and wishing the speedy recovery of John L. Brown and Pearl Terry
 Col. E. L. Atkins: Contribution to ACS
 Mr. and Mrs. Bland Massie: Contribution to ACS
 Dr. and Mrs. Daniel E. Nathan: Contributions honoring Marvin Jernigan for barbecuing chicken at Massee Lane, honoring the wedding anniversary of Brownie and Ann Brown and wishing for the speedy recovery of John L. Brown
 Mr. and Mrs. O. L. Jacobson: Contribution to ACS
 Mrs. Sadye S. Widmann: Contribution honoring Dan Nathan on Fathers Day
 Dr. and Mrs. Herbert Racoff, Judge and Mrs. Paul Harkey, Dr. and Mrs. J. M. Habel, Jr., Mr. and Mrs. Milton H. Brown, Mr. and Mrs. Douglas Deane Hall and Mrs. L. V. Teeter: Trophies for

The Campaign for American Camellia Society Endowment Fund

The following members and friends have "joined" one of the clubs or made additional contributions to them since the February issue of the *Journal* (Information as of June 16, 1983).

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—ACS—

Story of Front Cover Camellia

When Tammia Nursery Seedling No. 8222 was cut on Wednesday, January 12, 1983 it was placed in an orchid water tube and put in a plastic container in the refrigerator. No special care was taken. On Saturday, January 15, it was packed with 150 other blooms for a Tammia display. The seedling No. 8222 looked reasonably good when entered on the seedling table.

However things began to happen. The seedling seemed to enjoy its freedom from the closed plastic box! It perked up, showed renewed life, as if freshly starched and stood tall! As if to say, "Here I am! Look at me!"

Camellia japonica 'Charles Zerkowsky' seemed to be just the flower to be named for the uncle who showered love and affection on Sam and his sister Janette when their father and his brother passed to his heavenly abode while they were very young.

lilies for "the trade," including 'Camellia Joe' named for Joe Pyron. When you are in this area a visit to the One Horse Farm should definitely be on your agenda. As you stroll through the daylilies, herbs and other plants you will be "entertained" by the large number of peacocks and peahens in their gardens.

—ACS—

Air Mail For Overseas Members

Some of our Overseas Members have asked about the feasibility of sending our ACS publications to them Via Air Mail. It is feasible; the cost of air mailing the publications shown below is *in addition* to the cost of the membership dues.

COST OF AIR MAILING JOURNALS

The cost for mailing via Air Mail *the four issues of The Camellia Journal* is as follows:

Australia & New Zealand . . . US \$10.96
Japan and the Far East US \$10.96
United Kingdom &
W. Europe US \$ 8.56
Argentina & S. America . . . US \$ 8.56

(Continued on page 44)

New Herb Garden

To complement the cooks of our "Head Table Cooks" we now have a bona fide herb garden at Massee Lane. In an area some 8' x 48' the John Cranshaws designed and planted a beautiful herb garden. As time goes on more outstanding herbs will be grown here.

On June 24th Lonece and John and their small friend Miranda came from Perry, Georgia to plant the garden. They had labels made for each of the herbs planted. The Cranshaws own the One Horse Farm which specializes in hemerocallis and herbs. At Christmas time they make aromatic herb wreaths and sell them with the proceeds going to their Church. This couple are really great friends of the ACS and the Middle Georgia Camellia Society. Their hemerocallis garden is one of the finest and they have originated some really outstanding day-



Stretch your home into a garden with a Gothic Arch Greenhouse. Now is the time to do this before winter sets in.

A Horticulturist at Last

The special committee established to search for a horticulturist for Massee Lane has completed its job. The committee, composed of Dr. William Y. Bennett as Chairman and Dr. Luther W. Baxter, Jr. and Dr. Fred Galle, was unanimous in its decision to hire Mrs. Betty Hotchkiss. Betty did her graduate work under Dr. Baxter at Clemson University. Her Master's Degree is in plant pathology with a minor in horticulture. She is a Georgia "farm girl" and worked on her father's tobacco farm during high school and college years. She has been teaching and is now completing a research project in Minnesota.

Betty will come to Massee Lane in October and she looks forward to getting right to work "in camellias." Those of you who attend the annual camellia show here at Massee Lane will have an opportunity at that time to meet this young lady who comes to us extremely well recommended.

This is another dream that has come true for our Society. It will be "what it is all about" — to do research at our Headquarters. Betty will also be responsible for supervising the two workers in the gardens and greenhouses among her many chores. Who knows? Maybe one day we will even have a small laboratory at Massee Lane. As someone told us, "When you stop dreaming, dreams stop coming true!"

CLASSIFIED AD

FOR SALE: AMERICAN CAMELLIA YEAR BOOKS 1946 (first published) through 1963. Highest bidder before Oct. 1st, 1983, buys the books, WATTS POWELL, P. O. BOX NO. 381, VIENNA, GEORGIA 31092.

(Continued from page 24)

excellence. As you browse through the catalogue you can find many items that will quench your quest for excellence.

Our Society is honored to be able to have Ray Blackman be our dinner speaker on October 28th during our Fall Meeting at Longwood/Winterthur.

Camellias Registered with the ACS Since the May 1983 Journal

Name and Description	ACS Registry Number	Originator
'Thomas E. Gilley,' very large, bright pink, semi-double, <i>C. reticulata</i> chance seedling of 'Mouchang,' mid-season to late	1882	Paul Gilley
'W. P. Gilley,' large, bright pink, semidouble, <i>C. reticulata</i> chance seedling of 'Mouchang,' mid-season to late	1883	Paul Gilley
'Karen Gilley,' large, dark red, semidouble, <i>C. japonica</i> chance seedling of 'Ville de Nantes,' mid-season	1884	Paul Gilley
'Jesse J. Gilley,' very large, rose pink, semidouble, <i>C. reticulata</i> chance seedling, of 'Craig Clark,' mid-season to late	1885	Paul Gilley
'Mark Cannon,' very large, rich orchid pink, semi-double, <i>C. reticulata</i> chance seedling, of 'Arch of Triumph,' mid-season to late	1886	Paul Gilley
'Christopher Holman,' very large, clear red, peony form, <i>C. reticulata</i> chance seedling, of 'Pharaoh,' mid-season to late	1887	Paul Gilley
'L. T. Dees,' large, red, formal double, <i>C. japonica</i> chance seedling, mid-season to late	1888	C. V. Bozeman
'L. T. Dees Var.,' large red blotched white, formal double, <i>C. japonica</i> chance seedling, mid-season to late	1889	C. V. Bozeman
'Borom's Gem,' large to very large, pink, rose form double, <i>C. japonica</i> chance seedling, mid-season to late	1890	S. T. Borom
'Grace,' medium to large, rose pink, formal double, <i>C. japonica</i> chance seedling, mid-season to late	1891	S. T. Borom
'J. Stewart Howard Var.,' large, deep pink to red blotched white, variegated form of 'J. Stewart Howard,' mid-season	1892	E. Ray Bond
'Leila Gibson,' large white, peony form, <i>C. japonica</i> chance seedling, mid-season	1893	Leila Gibson
'Mary Cowan,' small, pink, formal to rose form double, <i>C. japonica</i> chance seedling, mid-season to late	1894	E. D. Cowan
'Wobby Boy,' medium, white flecked and blotched with light pink shading to darker pink, semi-double, <i>C. japonica</i> chance seedling, mid-season to late	1895	Wallace Herbert
'Mary Elizabeth Ballard,' medium, pink, formal double, <i>C. japonica</i> chance seedling, mid-season	1896	Ray Gentry
'Fragrant Joy,' miniature, dark lavender pink, rose form double, <i>C. hybrid</i> (<i>C. rusticana</i> x <i>C. lutchuensis</i>), mid-season	1897	Dr. Wm. L. Ackerman
'Margaret Davis Ashley,' medium, white to cream white with heavy dashings of vermilion from outer petal edges toward center, peony form, <i>C. japonica</i> mutant of 'Margaret Davis,' early to mid-season	1898	Gene King
'John Movich,' very large, glowing dark red, semidouble, <i>C. reticulata</i> chance seedling, mid-season to late	1899	I. John Movich
'Something Beautiful,' miniature, pale pink with Burgundy red edge on petals, formal double, <i>C. japonica</i> chance seedling, mid-season	1900	Edwin & June Atkins
'J. Stewart Howard,' large, deep pink to red, semidouble, <i>C. japonica</i> chance seedling mid-season	1901	E. Ray Bond
'Dr. Reeves Wells,' large, dark red, semidouble, <i>C. reticulata</i> hybrid (Womack 13 x 5 = [<i>C. reticulata</i> 'Cornelian' x <i>C. japonica</i> 'Mrs. D. W. Davis']), mid-season to late	1902	Frank Pursel
'Sara Dunham,' large, rose pink, semidouble to rose form double, <i>C. reticulata</i> ('Cornelian' x 'Jean Pursel'), mid-season to late	1903	Frank Pursel
'Dr. Emil Carroll,' very large, Burgundy red, anemone to loose peony form <i>C. reticulata</i> hybrid (<i>C. reticulata</i> 'Crimson Robe' x 5X = [<i>C. reticulata</i> 'Cornelian' x <i>C. japonica</i> 'Mrs. D. W. Davis']), mid-season to late	1904	Frank Pursel
'Ruth R. Dunn,' medium, pink, semidouble, <i>C. japonica</i> chance seedling, mid-season to late	1905	J. Ralph Dunn
'Dr. Robert K. Cutter,' large, red veined Turkey red, anemone form <i>C. hybrid</i> (D4[2] = [<i>C. japonica</i> 'Mrs. Bertha A. Harms' x <i>C. saluenensis</i> 'Apple Blossom'] x 'Temple Incense'), mid-season to late	1906	Dr. Robert K. Cutter
'June Atkins,' small to medium, pink and white, formal double, <i>C. japonica</i> chance seedling, mid-season to late	1907	Edwin & June Atkins

'Ed Atkins,' very large, red, semidouble, <i>C. reticulata</i> hybrid ('Crimson Robe' x 'Jean Pursel'), early to mid-season	1908	Frank Pursel
'Murray Shores,' very large, Burgundy red, semidouble, <i>C. reticulata</i> hybrid (<i>C. reticulata</i> 'Crimson Robe' x [<i>C. japonica</i> 'Tinsie' x <i>C. reticulata</i> 'Cornelian'] x <i>C. reticulata</i> 'Cornelian'), early to mid-season	1909	Frank Pursel
'Jean Comber,' large to very large, clear pink, semi-double, <i>C. reticulata</i> ('Crimson Robe' x 5X 'Cornelian'), mid-season to late	1910	Frank Pursel
'Tommy Weeks,' very large, deep red, semidouble, <i>C. reticulata</i> ('Crimson Robe' x 'Jean Pursel'), early to mid-season	1911	Frank Pursel
'Purplette,' miniature, deep magenta — veined, semidouble, <i>C. reticulata</i> hybrid (<i>C. japonica</i> x <i>C. reticulata</i>) chance seedling mid-season to late	1912	David L. Feathers
'Jean Feathers,' medium, basic white tipped pink, semidouble, <i>C. japonica</i> ('Dr. Tinsley' x 'Debutante'), early to mid-season to late	1913	David L. Feathers
'La Belle France,' large, pink edged white, semidouble, <i>C. japonica</i> chance seedling of 'Lady Vansittart,' mid-season to late	1914	David L. Feathers
'Debret,' large, salmon pink, peony form, <i>C. hybrid</i> [<i>C. japonica</i> 'Debutante' x <i>C. japonica</i> 'Waterloo'] x <i>C. reticulata</i> 'Crimson Robe'), very late	1915	David L. Feathers
'Pierce Lathrop,' large, rose pink, anemone form, <i>C. japonica</i> chance seedling, mid-season to late	1916	David L. Feathers
'Lafayette Beauty,' very large, silvery pink, semidouble, <i>C. reticulata</i> chance seedling of 'Lasca Beauty,' mid-season	1917	David L. Feathers
'Miniflora,' small, delicate pink two tone, semidouble, <i>C. japonica</i> chance seedling of 'Magnoliaeflora,' mid-season to late	1918	David L. Feathers
'Charles Zerkowsky,' very large, soft medium pink with white flecks, <i>C. japonica</i> chance seedling, mid-season	1919	Ferol & Sam Zerkowsky

— ACS —

GIBBING AIDS

F. F. BECKER II

Both can be easily and safely carried in shirt pocket while gibbing.

Due to size of needle, any small particle in gib liquid can easily clog it. In this event, take all covers off hypodermic syringe, pull plunger back as far as possible, without fully removing from chamber. Remove squeeze bottle needle and insert point first into larger needle on syringe. With one finger holding smaller needle firmly into larger needle, depress plunger with quick stroke. Obstruction can usually be dislodged with one stroke.

Where can you get this applicator? That is another question! You might try your doctor friend, the local hospital or clinic or a hospital supply company. I have been using this for several years. It is quite handy for someone who gibs as many as I do (both outside and protected). It is well worth the effort for you to try to get at least one.

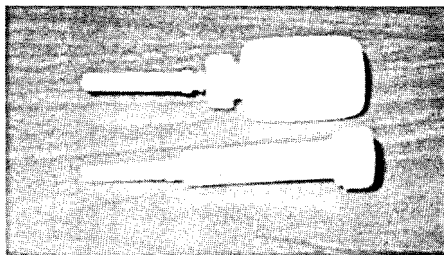


FIGURE #1: TOP — Plastic squeeze bottle with nipple screw on cap to accommodate hypodermic needle. This needle should be smallest available. (size 27G 1/2). Easy to control small single drop. BOTTOM — Hypodermic syringe, preferably with plastic case, cap and needle cover for easier and safer use. Needle size (22G1). This size needle comes with sharp point. File off to dull square point.

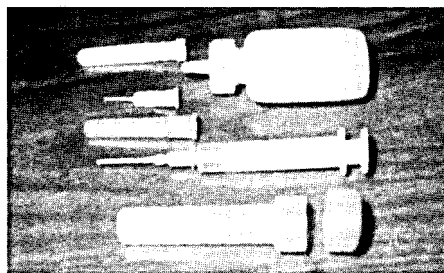


FIGURE #2: Both pieces of equipment broken down into component parts.

— ACS —

A Yellow Camellia Soon

Today, July 6th, we were told by Frank Pursel that he will be blooming the *C. chrysantha* in October or so. He sent

two color slides of branches of the plant that was given to him, at our urging, by Dr. William L. Ackerman of the United

States National Arboretum. Friends are already gibbing some large enough buds so that there will be fresh pollen to begin hybridizing as soon as the plant blooms. Some pollen of the "yellow camellia" will be shared with ACS; this will be an exciting new bit of research that Betty Hotchkiss, our new Horticulturist, will begin on as she enters into her duties at Massee Lane in October.

We will keep you informed on this exciting news. To the best of our knowledge these will be the first authentic blooms of *C. chrysantha* in the Western World. It has, from pictures that I have seen, bloomed in Japan last season.

We can hardly wait for the new and exciting colors this will eventually bring forth — peach, apricot, orange. Such crosses may also bring about a new group of early blooming camellias and, who knows, some heat-hardy ones also.



FIGURE 1
Here is a closeup picture of the budding of *C. chrysantha*. Grafts made Jan. 15, 1982. (Photo by Denis Winslow, Piedmont, California.)



FIGURE 2
Here you can note how the flower buds are set down along the stems instead of at the terminals. Grafts made on Jan. 15, 1982. (Photo by Denis Winslow, Piedmont, California.)

From The Desk of Executive Secretary/Editor

It is a great pleasure for me to introduce Gene Snooks to you all as Guest Editor of this Special Issue. While this issue is devoted to pests and diseases, it is not meant to scare you away, but merely to point out that you may at some time or other encounter one or more of these and you should be aware of them. I think you will agree with me that the issue that Gene has brought together is superbly done and should be a "hold item" on everybody's camellia book shelf.

Life Members

We are pleased to announce that since the May issue of the "Journal" we have another new Life Member. It is Mrs. A. J. Cavanaugh of Wallace, North Carolina.

Sustaining and Corporate Members

Since the May issue, we are pleased to announce that we have a new Corporate member — Dr. Angelo Azzellini, Euganea Floricoltori Coop, Padova, Italy. We also welcome a new Sustaining Member — Mr. Larry Breed of Bolingbroke, Georgia.

—ACS—

(Continued from page 41)

COST OF AIR MAILING YEARBOOK

The cost for mailing via Air Mail one issue of *The American Camellia Yearbook* is as follows:

Australia & New Zealand . . US \$ 6.70
Japan & the Far East US \$ 6.70
United Kingdom &

W. Europe US \$ 4.90
Argentina & S. America . . . US \$ 4.90

If an Overseas Member wishes all the publications to be sent via Air Mail, he need only add the two relevant figures above \$17.66 for Australia, New Zealand, Japan, China, Korea; and \$13.46 for United Kingdom and Western Europe and Latin America. The additional cost for mailing via Air Mail must be sent prior to 1 January 1984.

ACS MEETS IN ORLANDO, FLORIDA JANUARY 11-14, 1984

The Camellia Society of Central Florida and the cities of Orlando and Winter Park, Florida, take great pleasure in hosting The American Camellia Society Thirty-Ninth Annual meeting on January 11-14, 1984.

Orlando is the entertainment center of the World. Plan to spend your vacation with your camellia friends at the A.C.S. annual meeting and enjoy the many attractions in the area. Disney World, Epcot Center, Sea World, Kennedy Space Center, Circus World and many others make this a very exciting place to visit. Epcot Center, Walt Disney's dream, is a reality, taking you through time and space — across the continents of the world, and beyond your wildest imagination.

The American Camellia Society meetings will be held in the quaint center of Winter Park with its many antique shops and restaurants, at the Langford Resort Hotel. We plan to make this a very exciting time for everyone. A trip to Epcot is on the program. We have an annual dinner at Langford Hotel, an award dinner at Church Street Station and Cheyenne Salone and Opera House.

The city of Orlando and Leu Gardens will host A Camellia Festival at the beautiful Harry P. Leu Botanical Gardens. The Camellia Society of Central Florida will hold its 36th Annual Camellia Show at the gardens. The festival will include everything: bands, art and crafts, educational programs and also a beauty queen, Miss Camellia. The gardens have over 55 acres of camellias, azaleas, and collected plants from many parts of the world. Leu House is a showplace and a part of Orlando's history. A small cemetery, the final resting place of the first sheriff of Orlando is within the boundaries of the gardens.

We are planning a tremendous horticultural program with a tour of local greenhouse facilities.

Be sure to spend your vacation in "The City Beautiful" Orlando and Winter Park, Florida, and attend an outstanding American Camellia Society Convention beginning on January 11, 1984. (Details will be in the November issue.)

New Camellia Gifts and Prizes

We are now most pleased to offer to our members and friends and to the general public a new line of camellia gifts and prizes. These items are made exclusively for the American Camellia Society and were made available to us by Mr. and Mrs. Harold Friedman of Quality House of Atlanta, Inc. Those few people who have come by the Headquarters and have seen the items have been quite ecstatic about them. We have had a fair amount of sales prior to this general announcement.

As you will notice on the facing page you will see the colored pictures of most of the items that we have from this outstanding company, Quality House of Atlanta, Inc. The tray, item D, can come packed in a box with four of the executive or double cocktail glasses for \$32.50. The other prices are all self-explanatory.

We can either carry them to shows or conventions where we are going, if a firm order has been placed ahead of time; or we can ship them at the buyer's expense. The actual cost of postage and handling will be billed at the time of mailing. There will, of course, be no charge for personally bringing them to the buyer.

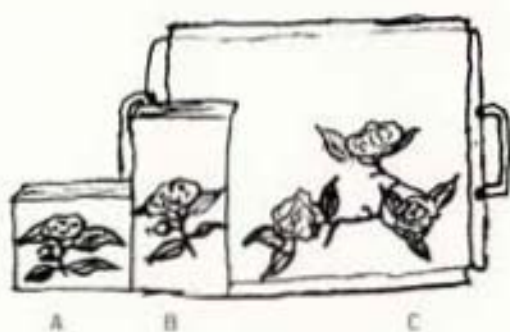
The white tiles with the red camellia are most attractive and priced very modestly, as you can see. The coasters, not shown, are a "crinkly" lucite with the camellia silk screened underneath the coaster which shows through very beautifully. They have their own lucite stand and sit up with all six in the stand.

Send your orders or requests for further information to Ways & Means, American Camellia Society, P. O. Box 1217, Fort Valley, GA 31030.

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NEW CAMELLIA GIFTS



A — Cocktail napkins, 50 per pack	\$ 3.00
B — Hand towels or dinner napkins, 40 per pack	\$ 3.50
C — Lucite Tray, 13½" x 17½"	\$32.50
D — Lucite Tray, 6" x 15"	\$17.50
E — Tumbler, hiball glass	\$ 5.00
F — Executive Glass, Double Cocktail	\$ 5.00
A set of the D Lucite Tray and Four Executive Glasses	\$32.50
Not Shown: Tile, white with camellia 6" x 6"	\$ 5.00
Lucite Coasters with camellia-six in case	\$10.00

(Details on Facing Page)

All Prices FOB Fort Valley. Cost of postage will be billed.

The Camellia Journal

WORLD'S LARGEST PUBLICATION DEVOTED TO THE GENUS CAMELLIA

Volume 35

Number 3

August, 1983

SUPER COOKBOOK

Head Table Cooks, the award winning name of the cookbook by The American Camellia Society was given to us by the late Charles C. Mason of Norfolk, Virginia.

The book contains 825 fabulous recipes sent to us by more than 350 cooks from many States of our Union and from the People's Republic of China, Japan, New Zealand, Australia, South Africa, Argentina, France, Mexico. The recipes reflect the cooking of all of the major areas of the U.S. and the rest of the World.

You can plan a full meal from the eleven menus that are accompanied by pen-and-ink drawings of homes, poolsides, patios and an interior done by James McCoy. The menus start with drinks and go on through desserts and coffees. They reflect a breakfast, a banquet, a brunch, a poolside luncheon, dinners, even a tea and buffet lunches and cocktail buffets. You will also find helpful hints and substitutions.

From a light snack to a heavy dinner, recipes for all of the makings are found in this attractive and truly helpful cookbook.

You can order your book NOW for the earliest delivery. We have them to send for your Christmas gifts or Wedding gifts. You can order for yourself and include your gift list and we will send the books directly from Masee Lane.

The book has hard covers and is spiral bound for your convenience when cooking.

The cost of this book is only \$10.00 plus \$2.50 for postage and handling for MEMBERS ONLY. (Georgia residents add \$.40 sales tax per book ordered.) For others, the cost is \$12.50 plus \$2.50 for postage and handling (Georgia residents add \$.50 sales tax per book ordered).

You can send your check or money order to Cookbook, The American Camellia Society, P.O. Box 1217, Fort Valley, Georgia 31030.

Reviews in various newspapers and TV in Georgia, South Carolina, Tennessee, Mississippi, Louisiana have been outstanding. *Macon Telegraph* calls it "an exciting new cookbook"; *Aiken Standard* says it "is a dandy cookbook," the *Chattanooga News-Free Press* in displaying a picture of the cover calls it "a wonderful new cookbook with a collection of recipes from around the world . . ."; the *Daily Sentry-News* of Slidell highlights the sketches by Jim McCoy and the recipes as

Head Table Cooks



American Camellia Society

probably the best there are; the *Jackson Daily News* with a color drawing of camellias in a vase, highlights not only the recipes but the menus, helpful hints and substitutions and points out that 115 recipes from 61 Mississippians from 18 Mississippi towns are included. The article in it and the Brookhaven newspaper were inspired by F. F. Becker II, the ACS Director from Mississippi. The *Albany Sunday Herald* writes, "What new cookbook has just about everything, traditional recipes, new versions of family ones, menus and beauty? Answer: *Head Table Cooks* . . ." *Fort Valley Leader-Tribune* says "Head Table Cooks is a collector's item," and that it is "fabulous."