JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD

EDITOR

VOLUME 49

1948

Published monthly by the New York Botanical Garden

BRONX PARK, NEW YORK 58, N. Y

TABLE OF CONTENTS

VOLUME 49

1948

(Exclusive of Book Reviews and Notes, News, and Comment)

June (No. 582)

July (No. 583)

August (No. 584)

September (No. 585)

October (No. 586)

COVER ILLUSTRATIONS

1948

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

VOL. 49
No. 577

JANUARY
1 9 4 8

PAGES
1—24

JANUARY EVENTS AT THE GARDEN

Museum Exhibits

Illustrations from new books by two of the Garden's members.

"Halfway to Heaven—A Guatemala Holiday" by Jean Hersey

"Strange Visitor"—the story of a praying mantis—by Edith Farrington Jol

Conservatory Displays

Primula, Cineraria, and *Narcissus* are among the groups of plants to be sho variety in the Conservatory.

Courses of Study

Two-Year Course in Practical Gardening

Outdoor Flower Gardening. Six sessions, alternate Thursday evenings, 8-10 p
Jan. 15—Mar. 25 Instructor: *Arthur King*

Two-Year Science Course for Gardeners

General Botany II. Twelve sessions, Monday evenings, 8-9 p.m.
Jan. 12 -Mar. 29 Instructor: *Dr. E. E. Naylor*

Systematic Botany Laboratory. Twelve sessions, Monday evenings, 9-10 p.m.
Jan. 12—Mar. 29 Instructor: *Dr. H. N. Moldenke*

Tropical Botany

Six sessions on alternate Thursdays, 8-9:30 p.m.
Jan. 29—Apr. 8 Instructor: *Dr. R. A. Howard*

Free Saturday Programs

3 p.m. in the Lecture Hall

Jan. 10 ***Framing the House with Shrubbery*** *Raymond K*
New Jersey State College of Agri

Jan. 17 ***Plants of the Past*** *W. H.*
Associate C

Jan. 24 ***Tree Diseases and Their Control*** *P. P.*
Plant Path

Jan. 31 ***"Miracle in Wood" and "Spare That Tree"***
Two motion pictures with

Members' Day Programs

Jan. 7 ***Report of a Scientific Mission to Japan*** *William J. R*

Radio Programs

"Calling All Gardeners" every Saturday morning from 8:30 to 8:45 over V

Forthcoming Events

Free Saturday Programs: Feb. 7, "The Romance of Tea and Coffee" by V H. Ukers; Feb. 14, "Berries and Small Fruits for the Garden" by Edwin B *Members' Day*: Feb. 4, "Some Orchids I have Grown" by Mrs. William K. du *Museum Exhibits*: February, Ornamental Algae.

TABLE OF CONTENTS

JANUARY 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New Y N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Pos at New York, N. Y., under the Act of August 24, 1912. Annual subscription $1.50. Single 15 cents.

JOURNAL

of

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VOL. 49 | JANUARY 1948 | NO. 577

Three Billion Bushels of Corn

By Gilbert H. Ahlgren and John C. Anderson

MORE than 90 million acres of land have been used for growing corn in the United States every year since 1943. This is about one-quarter of all the land under cultivation in the country, and it gives an annual harvest of approximately three billion bushels. Corn is grown in every state in the Union and, to some extent at least, on three out of every four farms.

The golden grain which Columbus discovered in the New World is now worth annually many times more than the spices that he sought in far-off India. It is more valuable than all the other grain crops in America—wheat, oats, barley, rye, buckwheat, and sorghum—combined. Acre for acre, too, its yield ranks high, with an average of 1,850 pounds, compared with 1,020 pounds for wheat, 1,150 for barley, and 1,148 for oats. (These figures are for 1945.)

The Authors

DR. AHLGREN, who comes from the Middle West, is head of the Farm Crops Department at the New Jersey State College of Agriculture at Rutgers University, New Brunswick. He received his agricultural training at the University of Wisconsin, Pennsylvania State College and Rutgers. He is the principal author of "Practical Field Crop Production," just published by the Rutgers University Press, and also the author of the chapter on Lawns in "Grounds for Living" edited for the same press by Van Wie Ingham and R. B. Farnham.

Dr. Anderson, who is Assistant Professor in the Farm Crops Department at Rutgers, is considered the corn expert on the staff. He was graduated from the University of Illinois in 1938 and received his Ph.D. degree from Rutgers in 1943. He also was one of the writers of "Practical Field Crop Production," which is to be reviewed in this Journal.

Of the estimated world output of five billion bushels of corn, the United States now produces about 60 percent. Europe (outside of Russia) raises almost half a billion bushels; South America a little less—420 million; Africa 240 million. (Recent figures for Russia are not available.)

Only once previous to 1943, and that was in 1920, did the American corn crop reach three billion bushels. For 1947 the total will likely be reduced to about 2½ billion, because the corn-growing sections of the country experienced floods and cold wet weather in spring, then suffered from heat and drought later in the season. Nevertheless, corn remains our greatest crop. During the past four years its annual value on the farm has been 3½ billion dollars. Many factors have contributed to its popularity and superior performance, and much credit is due to American inventive genius in learning how to grow this crop better.

History of Corn

The origin of corn (*Zea Mays*) is a mystery. It is believed to have originated in Central America, and records show that it was cultivated early by the Mayan, Totonac, Canari, Inca, and Aztec Indian tribes. Many of these cultures included a goddess of maize called Cintelo. Tribal worship of corn was common, and this custom indicates the dependence placed in this crop by the Indians of Central America and elsewhere. The plants which sired this great crop are not known for certain, but teosinte (*Euchlaena mexicana*) is suspected of being one of the parents.

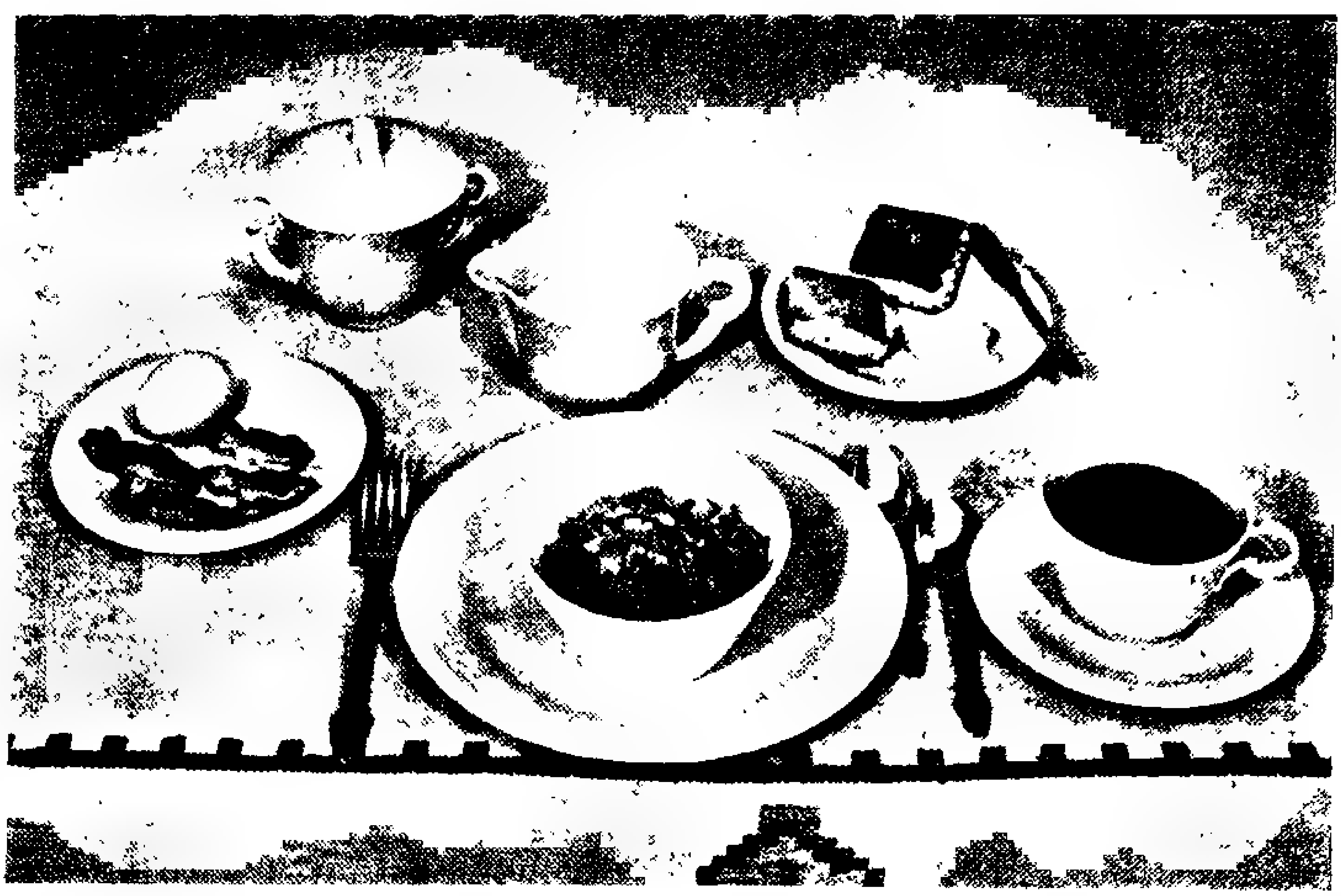
The early explorers visiting Central America discovered corn and brought it back to Europe, but there it became at first only a garden curiosity. The American colonists, however, driven by hunger, were quick to recognize the importance of corn. All of you recall the story of Squanto helping the Pilgrims to plant corn and to fertilize it by placing a dead fish under each hill. The corn crops of those precarious days helped the colonists survive the hard winters when bitter cold and dread starvation faced them in an unfamiliar land.

Prior to the white man's coming, the American Indian had developed corn of all of the types that are known today—dent, flint, sweet, flour, pod and popcorn. The white man's contribution has been better tools for tillage, more knowledge in fertilizing, and improved methods of culture and harvesting. Of all the grain crops, corn has reached the highest degree of dependence on man for survival. Without protection through cultivation, fertilizing and seed harvest and against insect, disease and animal ravages, this crop would surely perish from the earth. It is dependent on man for survival quite as much as we depend on it for much of our food supply.

Back in the days when the Indians of the Northeast were yet contesting the ability of the white man to take his hunting and fishing grounds from him, the success of the corn crop often decided whether the winter would be one of peace or of raids. Late summer and early autumn forays into the Indian country to destroy the corn crop there, was the best peace insurance the settlers had, since the Indians would be kept so busy during the winter hunting and fishing for food that they had no time to fight.

Adaptation and Distribution

Long before recorded history, nature began the improvement of corn. By what is known as natural selection, the corn plants which could not withstand heat, drought, poor soils and other unfavorable conditions died or reproduced so poorly that they were crowded out by the better adapted and more prolific plants. Corn is an easily cross-pollinated plant, hence the American Indian had ample opportunity to observe and select different types of corn. Flour corn, which is made up mostly of soft starch, was of great importance because it was easily ground into corn meal. Sweet corn satisfied the Indian's sweet tooth, and popcorn was probably enjoyed as much by the red men as by the white. The limiting and selecting effect of climate also helped to develop the different corn types and varieties.



FOOD FROM CORN IN VARIED FORM

Directly or indirectly, corn contributes to nearly every meal that is eaten. Here at the breakfast table are cornflakes, johnny cake, butter and cream that came from cows that were fed on corn, bacon from corn-fed hogs, and an egg from a chicken, part of whose diet was corn.

Within the borders of the Western Hemisphere there are now thousands of corn varieties. There are short ones two feet tall which mature in 70 days and others 24 feet tall which require 11 months to reach maturity. The color of most corn grain is yellow-orange. But red, purple, blue, pearly white, lemon yellow and white-capped yellow kernels are well known. More than 250 different characters have been studied by corn geneticists. The Russian plant explorers are said to have more than 8,000 kinds of corn in their plant museums.

Corn is grown as far north as latitude 58°N. in Canada and as far south as latitude 40°S. in South America. It is produced below sea level and at an altitude of over 12,000 feet. Corn can be raised with 10 inches of rainfall if most of this is during the growing season, and it also succeeds in tropical regions having over 200 inches annually. It is more widely grown over the earth's surface than any other cereal crop. Every month of the year sees corn being harvested somewhere in the world. These facts attest to its high degree of variability and adaptability.

More than 75 per cent of the American corn crop is grown in the north central states in the area commonly called the "Corn Belt." Here the deep fertile soils, the abundance of sunshine, and warm weather during the growing season, combined with an annual rainfall ranging from 20 to 45 inches, provide superior growing conditions. Those areas in the United States having 3 to 6 inches of rainfall each month for June, July and August are best suited for growing corn. Adequate moisture is especially needed for silking and tasseling of the plants. During this critical period an inch of rainfall literally can be worth a million dollars if the area affected is widespread.

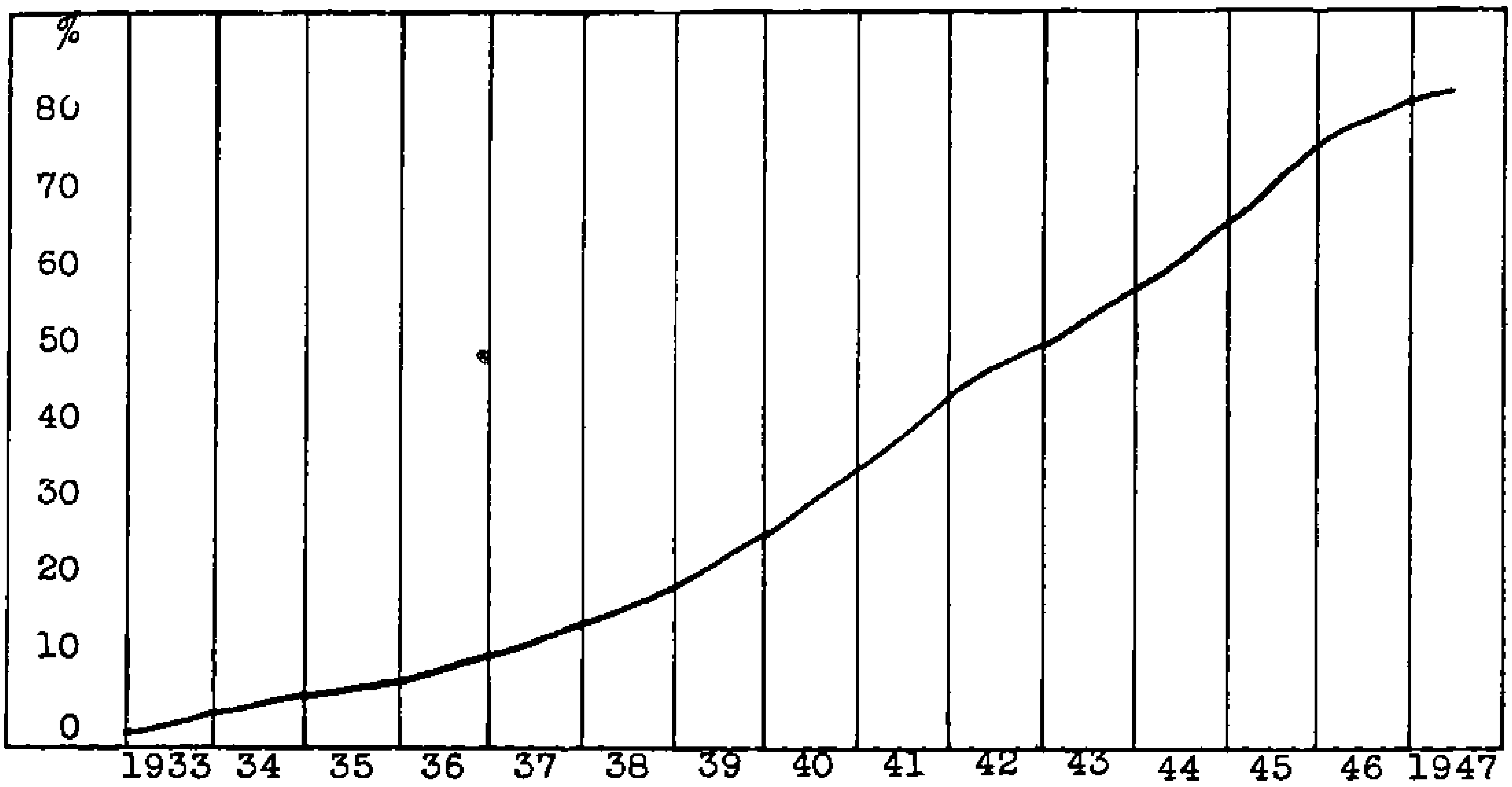
Average Yields

The yields per acre for this crop are highest in the northeastern and north central regions and lowest in the southeastern and southwestern states. Average yields in Iowa in 1946 were 60 bushels per acre, in New Mexico 17 bushels, Alabama 15.5 bushels, New Jersey 45 bushels and Minnesota 45.5 bushels.

Corn Hybrids to the Forefront

Hybrid corn seed is now being planted on seven out of every ten acres of corn land. Hybrids have been almost universally adopted wherever their superiority has been proved. Iowa is reported growing 100 per cent hybrid corn, Illinois and Indiana 99 per cent, and most other Corn Belt states over 90 per cent. Many of the southern states, being slow to adopt the hybrids, still plant mostly open-pollinated corn. The phenomenal increase in the percentage acreage of hybrids in the United States is shown in the graph on the opposite page.

CORN ACREAGE PLANTED WITH HYBRID SEED IN THE UNITED STATES, 1933-47*



* Bureau of Agricultural Economics data.

Almost 62 million acres are planted with hybrid seed. About eight million bushels, or 448 million pounds, of seed are required for planting. The time is fast approaching when our entire corn acreage will be planted to hybrids.

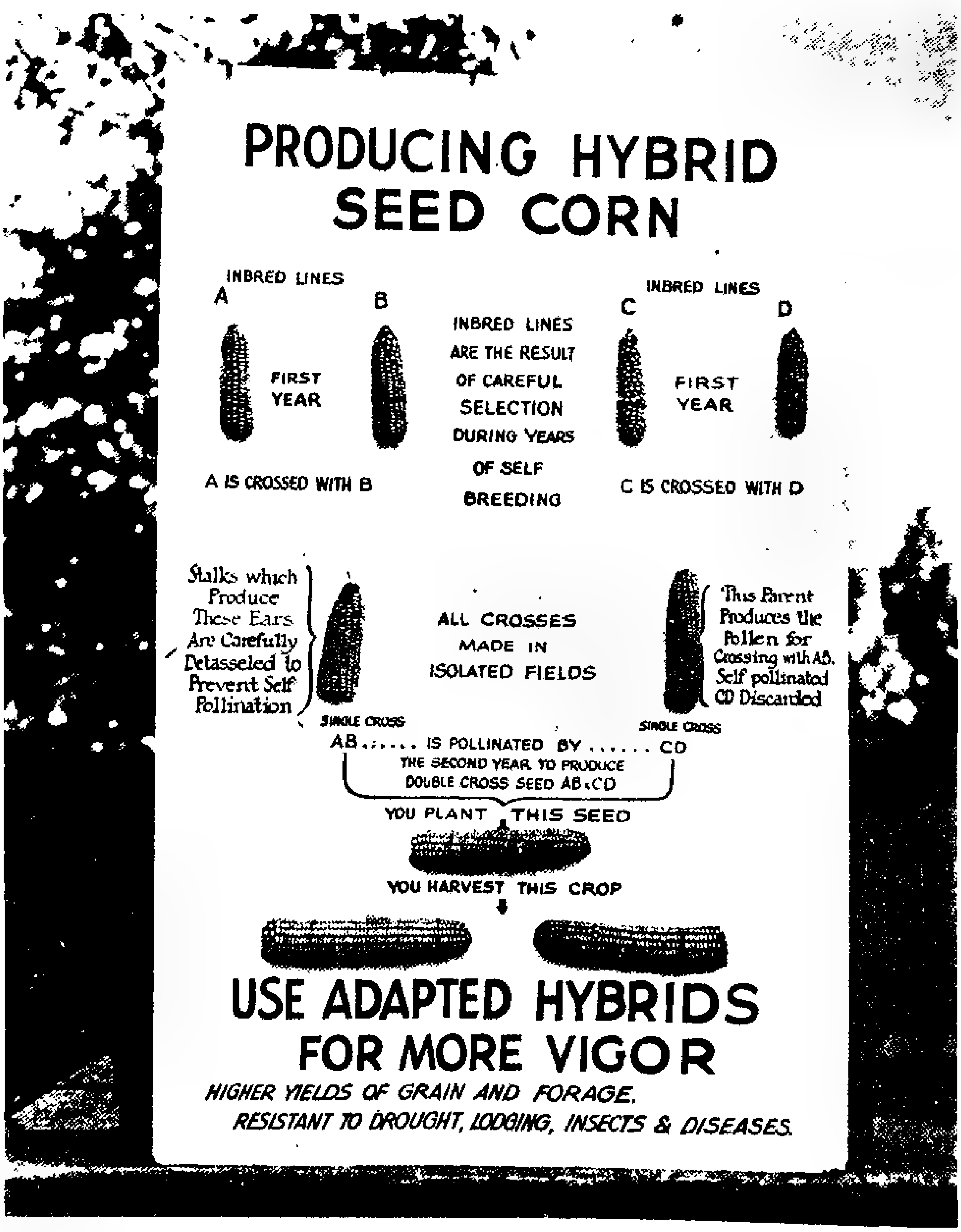
The reason is that hybrids have definite advantages over the old open-pollinated varieties. First of all, they are usually superior in yield performance, more disease-resistant, and less susceptible to wind lodging. Furthermore, the ears mature more uniformly and this factor is helpful where corn-picking machines are used for harvesting.

Producing Hybrid Seed

The production of eight to ten million bushels of hybrid seed annually is no small chore. Hundreds of specialists are engaged in this task and thousands of farmers are involved. Scientific techniques are combined with practical farming on a larger scale than with any other single crop.

The first step is to produce inbred lines, in order to get parents that are reliably stable in their characteristics. This is accomplished by selfing or inbreeding a field of corn—that is, using pollen only from the same plant or from sister plants in the same field. At the end of the season, rigorous selection is practiced, and seed from only the best plants is used the following year. The inbreeding is continued in this manner year after year until a satisfactory strain is obtained in which all the plants are highly uniform. To do this for a single strain often means from five to ten years of continuous work for the trained corn breeder.

The next step is to combine the inbred lines by controlled crossing. The way this is done is shown in the accompanying photographs. After the crosses have been made, a period of testing follows in which new hybrids are tested against proven ones for their performance value. Rigid standards imposed by the breeder eliminate most crosses, and the few that survive are then tested widely over the state or region where they are possibly adapted. Once the green light is given for any hybrid more production machinery is swung into action.



Successive steps in the production of hybrid corn are shown in this chart made at the New Jersey Agricultural Experiment Station.

Inbred plants to be used in hybridization must be produced in considerable quantities. First generation or single cross hybrids are made and these crossed to make the double cross. Seed of the latter is sold to farmers for their corn crop.

The corn breeder usually increases the inbred seed either by hand pollinations or a process known as sibbing. This method involves planting a single pure inbred line on isolated plots, free of foreign corn pollen, and permitting these plants to cross-pollinate freely. Hand-pollinated seed is generally used for growing sibbed seed, thus reducing danger of loss of purity.

Single cross and double cross hybrids are also grown in isolated plots away from other corn fields. (The minimum distance is usually 40 rods.) Here one line serves as the pollen parent and the other as the ear or seed parent. Thus three or four rows of a seed parent are planted consecutively, then a row of the pollen parent, followed by the seed parent again. The seed parent is rigidly detasseled to prevent any inbreeding, since inbreeding reduces the vigor of the hybrid. This phase is so important that most states have field inspectors who check on these farm fields every two or three days to see that the detasseling has been properly done.

The original corn hybrids produced back in the early 1900s were single crosses made expensively by hand pollination. Dr. D. F. Jones of the

FIELD FOR PRODUCING HYBRID CORN IN IOWA

The light-colored rows are for pollen production. The four intervening rows have been detasseled and are used exclusively for seed. A field like this is isolated from all others to prevent cross-pollination with undesirable varieties. (U.S D.A. photo)

Connecticut Agricultural Experiment Station devised the present system of making hybrids in the field. He also discovered that double crosses will yield as well as single crosses and are more adaptable to varying field and climatic conditions. More important than either of these was the fact that 30 to 50 bushels of double cross seed could be grown for the same cost as 5 to 10 bushels of single cross seed. Of all the hundreds of hybrids grown commercially, only a few are now single crosses.

The single and double cross seed is graded for size and shape and tested for germination. It is then labeled according to the hybrid and stored until purchased by the farmer for planting purposes.

Growing the Corn Crop

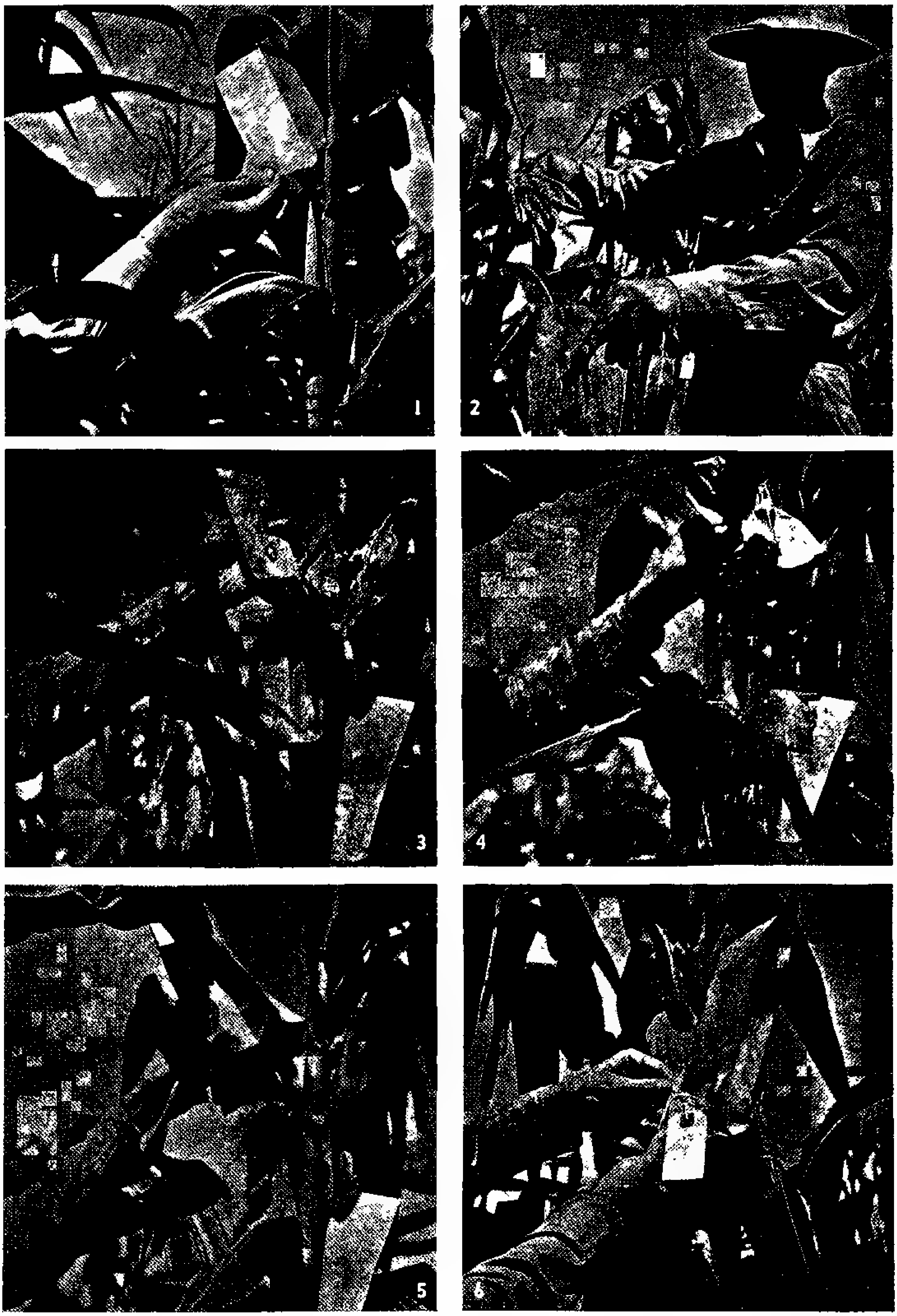
Corn occupies a prominent place in the labor requirements of 60 to 70 per cent of American farmers. The corn season starts with planting time, beginning in early April in the southern states and continuing until the middle of June in the northern latitudes. In America most farms are mechanized for this work with corn planters. There are one-row, two-row, four-row and even larger planters available, but the two-row planter is the size most widely used. Any of them can be mounted on tractors or drawn by a team of horses. This annual operation concerns some 10 to 12 million bushels of seed corn.

Over much of the United States fertilizers are applied to the soil for growing corn. Some farmers apply as little as 100 pounds and others as much as a ton per acre. The United States Department of Agriculture estimated in 1942 that 2.2 million tons of fertilizers were being used each year in growing our gigantic corn crop. Production of the three billion bushel crop of corn that we now generally have requires 1,800,000 tons of nitrogen, 675,000 of phosphoric oxide and 1,500,000 of potash. Extra fertility for the corn comes from farm manures, plant refuse, and the natural soil reservoir.

(On the opposite page)

STEPS IN THE HAND-POLLINATION OF CORN

(1) Before the silk appears, the ear is protected with a paper bag to prevent pollination from undesired strains (2) Pollen is shaken into a bag from the tassel of a selected strain of corn (3) The bag is removed from the ear for a moment after the silk has appeared. (4) The pollen gathered is shaken over the exposed silk. (5) The pollinated ear is immediately covered again with the paper bag. (6) A label is attached to show the parentage of the seed which will be produced in the hand-pollinated ear.



STEPS IN THE HAND-POLLINATION OF CORN

Normally, cultivating must follow planting if the crop is to be succe ful. Most farmers must cultivate three or four times to control wee adequately. Their tractors run at the rate of three or four miles per hc

After the silk of an ear of corn has been pollinated by hand, the entire ear is pro tected with a paper bag.

and cover one, two or four rows each trip. A two-row cultivator travels 1.18 miles in cultivating a single acre of corn. On this basis, 400,000,000 miles are traveled annually by American farmers in fighting the weed menace to the corn crop. Farm tractors use about 300 million gallons of gas in accomplishing this task.

Recently agricultural scientists have put an old chemical, 2, 4-D (dichlorophenoxyacetic acid) to a new use—the control of weeds in corn. By spraying about a pound of 2, 4-D per acre on the soil soon after the corn has been planted, the weeds are prevented from growing for 4 to 6 weeks. Also the weeds can be sprayed after they are up and quite effectively controlled. These methods are still experimental but the cost is small and the possibilities enormous.

After the corn is "laid by" (last cultivation) there is a period when yields cannot be influenced by man-made methods except through irrigation. Few farmers irrigate their corn and so "old man weather" takes complete charge. Hot days during July and August with enough rain regularly help make three billion bushel corn crops. Cold weather and dry weather, such as occurred in 1947, can ruin the best predictions and so the corn farmer is ever conscious of the clouds, the sun and the wind.

Harvesting is now done mostly by machinery. Since each ear weighs from ½ to 1 pound there are about 700 to 1,000 billion ears to be stripped of their husks and stored each fall. There are from 7 to 15 thousand ears on each acre of land. Thousands of mechanical corn pickers go from sun-up to sun-down during October and November, catching the golden ears, husking them with ingenious man-made fingers and throwing them into wagons or trucks driven alongside. But even in this mechanical age about 23 million acres of corn are husked by hand. Some farmers cut the stalks and stand these in corn stacks waiting for the ears to cure before husking and storing away.

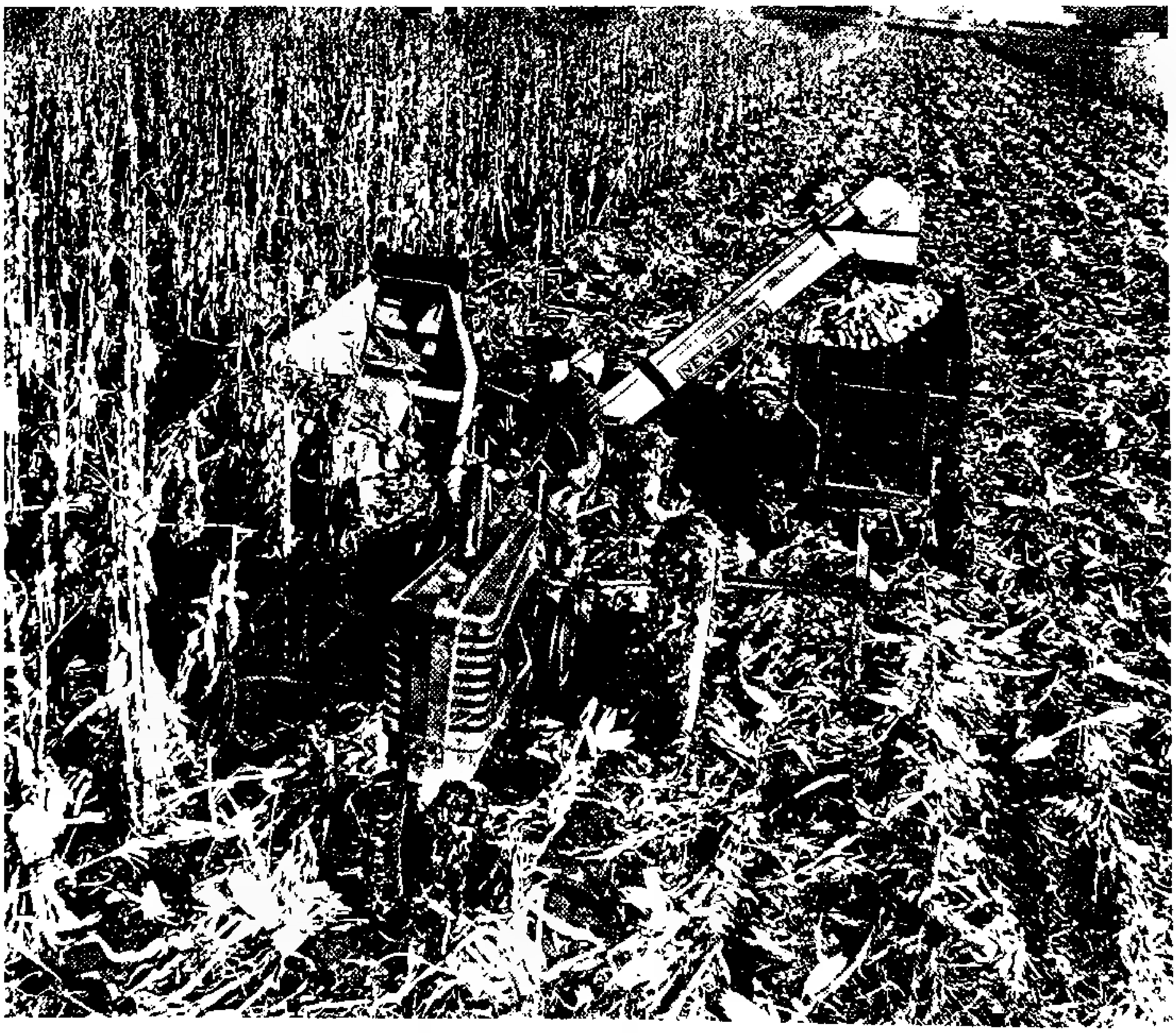
The National Husking Contest annually held in the Corn Belt attracts the largest crowd of any sporting event in the world. This contest is likewise the most gruelling of sports with the contestants husking at top speed for 80 minutes with no rest periods or time out.

An immense hubbub of activity grips the entire corn farming regions during the crisp autumn season. Not all corn is husked for grain; the plants from about five million acres go into the silo where they ferment slightly to become a succulent feed relished by livestock during the winter.

The Manifold Uses of Corn

More than two billion bushels of corn, or 80 percent of the crop, is consumed directly as feed for livestock. A large part of the remainder is used for the manufacture of feed products, such as corn gluten feed and corn gluten meal, from different parts of the kernel, corn oil, cake meal, corn distillers' grains, hominy feed, and many others. Beef, milk, butter, cheese, pork, fowl, eggs, and other livestock products result from the corn fed to the animals, and thus contribute to human nutrition. In all, H. T. Walden, editor of *Corn*, published by the Corn Industries Research Foundation, estimates that 88 percent of our total crop is used eventually for food. This is equal to 148 billion pounds, or 1,100 pounds of corn per person per year in the United States. Few of us realize that, in addition to corn on the cob, in cans, as cereal flakes, and out of the popper, we each consume the equivalent of three pounds of corn every day in the year! Probably not a person in the United States passes a day without eating some product of corn. In one form or another this grain supplies more food to satisfy the American appetite than any other single crop.

The more important industrial uses for corn and corn products number about 500. We are all more or less familiar with corn starch, corn syrup,



Hybrid corn which grows at a uniform height and matures its ears at a given time is easily harvested with a mechanical corn picker, such as the one shown here. Two, three, or four rows may be handled at a time.

INDUSTRIAL PRODUCTS DEPENDENT UPON CORN

In addition to corn cob pipes and the various familiar starches, syrups, oils and other food products from corn, this native American grain contributes to the manufacture of more than five hundred important industrial products. The cobs are used as a source of furfural, which is used in the manufacture of the nylon that goes into stockings. The dextrins of corn are used in making sandpaper, ink, soap, and many other products. When corn steep is added to the medium in which the fungi are grown to produce penicillin and streptomycin, a more vigorous growth and consequently more abundant product is obtained.

grits, meal, hominy, corn sugar, corn oil, and even "corn liquor," but these are only a beginning.

The stalks and leaves of corn are used for packing material, paper, paperboard and wallboard. The cobs finely ground are used for cleaning furs, polishing metal, in sweeping compounds, and as the absorbent in dynamite. And now the cobs are even being used as a source of furfural, which can be combined with other chemicals to make nylon stockings. Enough furfural can be secured from a bushel of corncobs to go into the making of about forty pairs. Corn cob pipes are made from giant cobs produced by a special strain of corn.

Besides being made into johnny-cake, corn meal is used as a core binder in making molds for castings. Corn starch, in addition to puddings, is used for sizing on both paper and cloth. The dextrins of corn are used in the manufacture of ink, explosives, linoleum, sandpaper, dyes, soaps and shoes.

The micro-organisms which produce penicillin and streptomycin increase their yields of these wonder chemicals ten fold when the steep water of corn is used in their growth medium.

These are only a small portion of the uses of the golden grain. Is it any wonder then that in the books of many authorities the rise of America is found to be coincident with the increasing importance of corn?

Japanese Paper-Plant for Bold Foliage In Mild-Climate Plantings

By B. C. Blackburn

THE handsome shrub that is known as the Japanese paper-plant (*Fatsia japonica*) quite transcends the unprepossessing name assigned to it by two French botanists in 1854. With questionable accuracy and complete abandonment of euphony, Decaisne and Planchon proposed, in an issue of *Revue Horticole*, that the Japanese name, YATSUDE, be Latinized as *Fatsia*. YATSUDE—meaning "hands with eight fingers" and pronounced "yatt su-deh"—refers to the palmately lobed leaves, which usually show from seven to nine bold divisions.

The shrub is one of the most characteristic used in park and garden plantings in its native Japan, and like its close relative, English ivy, it has the happy faculty of thriving in cities and in rather poor soil. The paper-plant is at its best in a fertile, moist location, however, and protected so that winds will not batter the large evergreen leaves, which may measure to 12 or 16 inches across. Unless planted in exceptionally favored locations, YATSUDE cannot be expected to succeed outdoors much north of Washington, D. C., though it has done well on Long Island. Frost does not injure the blossoms, but temperatures much below 20° F. for any length of time cause fatal damage to the stems.

In a protected situation sheltered from winds, the Japanese paper-plant makes a striking shrub from 8 to 10 feet high, or even taller, and in November and December, when the large branching panicles of ivory-white flowers in round umbels are set against the glossy leaves, the effect is very fine. The branches of the clusters are white, like the flowers, and the separate umbels look much like those of English ivy, but are more attractive in color and composition.

A misalliance between *Fatsia japonica* and *Hedera Helix* about 1911 produced *Fatshedera Lizei*, a straggling evergreen shrub which seems to embody a concentration of the less favorable characteristics of both parents, while showing few of their good points. Although well grown greenhouse specimens have been seen, fortunately the plant is not often encountered.

The famous rice paper of China is made from skillfully cut pith sections of a deciduous relative formerly known as *Fatsia papyrifera* but now acknowledged to be *Tetrapanax papyriferum*, but the Japanese species apparently is not suitable for this purpose. At least, it is not so used in

Japan, where since the 16th century paper-making has rested on three other plants—a paper-mulberry and two shrubs of the Daphne family. However, any name to escape the unattractive scientific one seems welcome, and Japanese paper-plant seems acceptable.

Fatsia japonica produces handsome evergreen foliage and striking flowers in a mild climate. This photograph was made by the author while in Japan. The shrub is known to thrive in the warmer parts of eastern United States.

A Note on the Early Life Of Robert S. Williams

By Otto Degener

DURING my intermittent stays at the New York Botanical Garden after 1923, I was always attracted to a modest and reticent scholar, an elderly, bearded man with a youthful spring to his gait, keen blue eyes, and a strikingly gentle voice that bespoke all his actions. This man was Robert Statham Williams, by profession a bryologist but by avocation an old-fashioned naturalist throughout his long life.

Mr. Williams died March 13, 1945, at the age of 86. His later career and his accomplishments are well known and are recorded elsewhere.* But an interesting phase of his early life, gathered for me in Great Falls, Montana, by my friend John R. Cox**, is worthy of record.

Great Falls, which is today the largest city in Montana, with 40,000 inhabitants, was founded in 1883 by Paris Gibson, who later became its first mayor. According to Mayor Gibson, "R. S. Williams, a naturalist, built the first cabin" in Great Falls. This is not strictly true, as his habitation was not within the boundary of the town, as then drawn. He lived, for a short time, according to Mrs. Arthur Maxwell, daughter of H. P. Rolfe, another of the first inhabitants, "in a shack along the river between Giant Springs and Rainbow Falls when he was a neighbor of Mr. & Mrs. Theodore Gibson," son and daughter-in-law of Mayor Gibson. This shack consisted of a board frame covered with canvas, and with the canvas roof covered with earth. He lived likewise at times in a log cabin near a big cottonwood tree, on the riverbank, probably with S. A. Beachley, another of Great Falls' earliest residents.

According to a recent communication from Mrs. Theodore Gibson, "Robert Williams lived in Great Falls for some time before I met him, and I don't know whether or not he built or occupied that first log cabin. When I arrived in Great Falls in 1888 we lived the first year in a little house on the river bank, not far below that Giant Springs, and Robert Williams lived in a shack about a half mile from us. My husband had known him for a long time, in Minneapolis and in Great Falls, and he was our first neighbor. He was at our home very often, and we always enjoyed his company. He played the flute and my husband, the piano, so we had lots of music, and pleasant conversation. We drove with him in his farm wagon to Yellowstone Park, camping on the way and

Robert S. Williams in 1890, as a librarian in Great Falls, Montana. One of his collection of stuffed birds is partly visible at the upper left.

* Jour. N. Y. Bot. Gard. June 1945.

** John Rodda Cox, an electrical engineer long resident in the Hawaiian Islands, was born in St. Hearth, Cornwall, England, Sept. 5, 1865, and died in Great Falls, Montana, Oct. 2, 1946.

in the park, but the roads were very rough, and we decided to return by train, while Robert drove back alone."

Mrs. Kate Beachley, the third white woman to make her home in Great Falls and now over ninety years of age, stated that "Robert Williams and Fred Anderson were two very fine gentlemen who visited my husband (W. P. Beachley, brother of Silas, one of the first few settlers) and I frequently, and I think they would have died during that bitter cold winter of 1884 had I not watched over them and baked their bread." The Williams and Anderson cabins "were on the same side of the avenue and about a half block apart."***

"The Great Falls Tribune" for March 20, 1886, printed a short item: "We doubt whether there is another collection of stuffed birds in Montana equal to that of Robert Williams or a finer collection of plants than that of Fred Anderson." Then from the issue of December 25, 1889, we learn that "Librarian Williams has put the Valeria library in excellent order. In the front room on the north side are shelves for fully 1,000 books. Many excellent books have been already placed there. In the next room is a fine set of 'Encyclopedia Britannica.' The adjoining room, which is the largest, is reserved for periodicals and newspapers. The rooms are carpeted and provided with tables. The library may soon be opened to the public." The Valeria Library, founded largely through the efforts of Mayor Paris Gibson, who named it for his wife, was opened in Great Falls in January, with Mr. Williams its first librarian. The accompanying photograph, taken that year, shows Mr. Williams at his desk, with books and stuffed birds about him. He resigned as librarian in October 1891.

One of Mr. Williams' early articles, describing the effect of the spray from Rainbow Falls in winter on the evergreens, was reprinted in "Great Falls Yesterday," a book published in 1939 and comprising a collection of biographies and reminiscences of early settlers.

"The Great Falls Tribune," in prophetic tone, printed in 1887 that "Robert S. Williams and Fred Anderson in their quiet way are pursuing the investigation of Montana botany and ornithology. Tho not appreciated now, their names will be honored in future years for their unrequited but important fields."

*** They were across the avenue from "Vinegar" Jones' cabin, near where Fifth Street and Fifth Avenue now intersect, and within the early town limits of Great Falls.

Notes, News, and Comment

Japanese Books. The Garden's Library is the recipient of a generous collection of books, booklets, and reprints, sent home from Japan at the end of the summer by Dr. William J. Robbins. The volumes were largely the gifts of Tomitaro Makino, Chobei Takeda, and other Japanese botanists. Among them are "An Illustrated Flora of Nippon" by Makino, with ten plates in color, besides a drawing of each species described; the "Flora Japonica," "De Historiae Naturalis in Japonia Statu," and "Fauna Japonica" of Siebold; "Researches on the Chemical Therapy of Tuberculosis" by Hideji Hasegawa; portions of the Memoirs of the College of Science, Kyoto University; several volumes of "Acta Phytotaxonomica et Geobotanica"; part 2 of volume 1 of "Icones Florae Japonicae"; "Culture and Utilization of 'Kozo' and 'Mitsumata' for High-Grade Paper in Japan"; "Unusual Materials as Foodstuffs in Japan"; "Natural Resources of Japan," and volumes on the manners and customs of the country. There are in addition seventy reprints of scientific papers.

Volunteers. Dr. William J. Robbins addressed the Volunteer Associates of the New York Botanical Garden on his 1947 trip to Japan at a luncheon in the Members' Room Oct. 14.

Research Project. Anita Appel Rolnick has returned to the Garden to assist in a research project on the origin of species in the bakery mold, *Neurospora,* under the direction of Dr. B. O. Dodge and aided by a grant from the American Philosophical Society. As Anita Appel, Mrs. Rolnick was Technical Assistant on the Garden's staff from July 1943 to July 1944, working with Dr. Stout. She had previously worked under Dr. Stout on a two months' scholarship. Several years earlier, she had been a volunteer there, then an assistant to Dr. Dodge with a grant-in-aid from the American Philosophical Society.

Conference. Dr. S. M. Zeller of Oregon State College addressed the monthly conference of the staff and students at the Garden Dec. 11 on "Stone Fruit Viruses in the Pacific Northwest." With the retirement of Dr. A. B. Stout, the conferences have been placed in charge of Dr. W. H. Camp.

Nicholas Murray Butler. The New York Botanical Garden lost one of the oldest members of its Corporation with the death of Nicholas Murray Butler Dec. 7. Dr. Butler, who was President of Columbia University from 1901 until his retirement in 1945, was elected to the Corporation of the Garden in 1906. For four years previously he had served as one of the Garden's Scientific Directors, and he retained this post until the duties of this group were absorbed by the Board of Managers in 1933.

Mrs. Percy H. Williams. The death of Mrs. Percy H. Williams of New York, a member of the Advisory Council, occurred Dec. 11. Mrs. Williams had been elected to the group and also to the Corporation of the Garden Jan. 12, 1942.

Chief Research Associate. Effective Dec. 1, 1947, Dr. H. A. Gleason was relieved of his administrative duties at his own request, and became Chief Research Associate and Curator, in place of Assistant Director and Curator. He is now devoting himself to his scientific studies on a part-time basis.

Curator Emeritus. After 36 years as a member of the staff of the New York Botanical Garden, Dr. A. B. Stout became Curator Emeritus Nov. 1, 1947. He came to the Garden in 1911 as Director of the Laboratories, and in January 1938 was made Curator of Education and Laboratories.

Visitors. A few days before sailing on Dec. 8 for Australia, where he will collect plants on the Cape York Peninsula for the Archbold Expeditions of the American Museum of Natural History, Leonard J. Brass of Lake Placid, Florida, spent a day at the Garden.

Dr. Walter Swingle of the United States Department of Agriculture and the University of Miami consulted with several members of the staff at the Garden Dec. 18 and 19. He has recently returned from France.

Dr. A. B. Hatch of the Bristol Laboratories conferred with Dr. William J. Robbins Dec. 5.

K. Bhavnani of Karachi, India, one of a group of 1,500 making a survey of economic conditions in the United States, was at the New York Botanical Garden Nov. 19.

Among other recent visitors have been Carroll W. Dodge of the Missouri Botanical Garden; G. H. M. Lawrence, Bailey Hortorium; Rupert C. Barneby, Wappingers Falls, N. Y.; Charles Thom, Port Jefferson, Long Island; Frank E. Egler, Norfolk, Conn.; H. K. Svenson, American Museum of Natural History; and Norman Taylor of New York, with Mrs. Taylor.

Lectures. The New York Farmers heard Dr. William J. Robbins speak on his recent trip to Japan, with some observations concerning the country's agriculture and basic food supply, at a meeting at the Metropolitan Club in New York Dec. 9. The Japanese trip was also the subject of a talk before the Bronxville League of Women Voters in November.

T. H. Everett spoke on "House Plants" before the Garden Club of America Nov. 18 and exhibited seventeen specimens.

George W. Pucher. A heart attack caused the sudden death of Dr. George W. Pucher, biochemist at the Connecticut Agricultural Experiment Station, Nov. 19. Dr. Pucher was the author of the article, "Plants as Treasure Houses of Rare Chemicals," which appeared in the Journal of the New York Botanical Garden for April 1947. Part of his article concerned the presence of isocitric acid in the leaves of *Bryophyllum*. Dr. Pucher was responsible for the identification of this once relatively rare chemical substance, which has since been found to be one of the most widely distributed organic acids in nature.

New York Teachers. More than 100 members of the New York State Teachers Association came to the New York Botanical Garden Oct. 31 for a special program, arranged by Anna M. Greve of Bronxville. The program included a guided tour of the Conservatory and addresses by Dr. E. E. Naylor on "What the New York Botanical Garden Offers to Schools" and by Dr. R. A. Howard on "Plant Exploration in the Tropics."

Honored by Nurserymen. At the annual summer meeting of the New Jersey Association of Nurserymen at Bridgeton Aug. 15, Dr. P. P. Pirone, who was their secretary for nine years, was honored, in appreciation for his past services, with presentation of a gold wrist watch.

Flora Hawaiiensis Reissued. To replace the volumes lost when a tidal wave hit Hawaii April 1, 1946, Otto Degener has had the first four volumes of his "Flora Hawaiiensis" (or "The New Illustrated Flora of the Hawaiian Islands") reissued by the offset process and bound as a unit. Typographical corrections have been made in this new edition, with footnotes indicating the pages on which they occur.

The loss of these books by tidal wave depleted the author's stock completely, for it followed his disposal of large numbers of volumes by gift to libraries over the entire United States in early 1942, placing them there in preference to running the risk of their being destroyed by bombing. The new edition makes the entire work, to date, again available. Its price is $6.

Since his wartime sojourn at the New York Botanical Garden, Mr. Degener has been pursuing his botanical studies again in Hawaii for the past year.

NOTICES AND REVIEWS OF RECENT BOOKS

Emergence of a Man of Worth In Scientist's Appraisal of Burbank and His Work

LUTHER BURBANK, A VICTIM OF HERO WORSHIP. Walter L. Howard. Chronica Botanica. Vol. 9, pp. 299-506. Illustrations, bibliography, index. G. E. Stechert, New York; Chronica Botanica Co., Waltham, Mass., 1946. $3.75.

This is a notable book published just twenty years after the death of the propositus, which occurred on April 11, 1926. It attempts for the first time an unbiased survey of all the evidence available concerning Mr. Burbank's background, personality, activities, methods, achievements, his significance and value as a man, a mentor of youth, a scientist, and an originator of new horticultural productions; his ethics, his religion, his importance as a world figure, and his permanent place in the hall of fame.

The author came to the difficult task of writing this critique with an exceptionally adequate background of preparation. Professor Howard was born near Springfield, Missouri, in 1872. After attaining his B. Agr., B.S., and M.S. degrees from the University of Missouri, he won a Ph.D. degree from Leipzig, then undertook a year of post-doctorate study at Halle-Wittenberg. He also studied at East Malling Research Station, England, and investigated horticultural problems in France and contiguous countries in 1921-1922. He began his professional career as Assistant in Horticulture at the Agricultural Experiment Station of the University of Missouri, and was then successively Instructor, Assistant Professor, and Professor of Horticulture there. In 1915 he went to the University of California as Associate Professor of Pomology, and was promoted three years later to be Professor and the Head of the Department of Pomology. In 1925 he became Director of the College of Agriculture, and has been Professor Emeritus since 1942. He is therefore on a completely different footing from any of the previous authors who have written about Mr. Burbank and his work.

In special preparation for this comprehensive treatment of his subject, Professor Howard compiled a complete list with historical notations of all the new varieties offered for sale at one time or another by Mr. Burbank, and described in any of his circulars and catalogs. This list was published in 1945 as Bulletin No. 691 of the Agricultural Experiment Station of the University of California, and is obtainable by anyone free of charge on request addressed to the Publications Secretary of the Experiment Station, Berkeley 4, Calif. This 110-page bulletin is summarized in a 24-page chapter in the book under review.

The author also spent ten years in contacting every available source of information concerning Mr. Burbank.

The spirit of his treatment is well stated in the following quotation from the author's felicitious prologue. He says:

> "The character sketches which make up this book have been prepared in a spirit of fair play to enable the reader to understand and appreciate Luther Burbank. Circumstances over which he [Burbank] had little control clothed him in glittering tinsel, but a veil of darker hue was superposed when he became the tool of schemers. Temperament, eccentricities, and unwise talk—all nonessentials and unimportant — added to the confusion and helped to warp the judgment of observers. This was particularly true of those who had to reach conclusions second hand.
>
> "With none too gentle hands I have endeavored to tear away these hindering habiliments to see what the real Burbank looked like. And behold, a pristine figure emerges that is every inch a man of worth, a man of original ideas; a man with a definite mission in life, fully capable of standing on his own feet as a lone worker in the field of science.
>
> "It is impossible to evaluate Burbank's accomplishments with finality, but they were many and diverse, some direct, some indirect. Delving into details, the historian is amazed at the multiplicity of things that one man could do. With prejudice excluded there still will be honest differences of opinion regarding the scientific value of his work. Liberals will concede much, the punctilious may equivocate."

The book is meaty and very readable and deserves to have a much more general reading than seems to be likely in view of its publication in a specialized periodical which to the layman is relatively unknown.

The typography is good and the proofreading has been well done, but on page 493 one reads "borne" for "born," and on page 480 the dates of the present reviewer's activities as observer of Mr. Burbank's operations for the Carnegie Institution of Washington are incorrect by two years, the correct dates being 1906-1911, instead of 1904-1909 as stated. That this is an inadvertent slip is shown by the fact that these dates are given correctly in the above-mentioned Bulletin No. 691. Another slip on a date is seen on page 353, where the rediscovery of Mendel's laws of heredity is given as 1901 instead of 1900, and this error is repeated by implication on page 369.

One of the longer chapters, treating of "Burbank the scientist," will doubtless prove most interesting to the scientific reader, but also somewhat disappointing. One reads with some surprise the statement that Thomas Andrew Knight's "whole interest was in the production of useful plants," and that it is "barely possible" that Burbank, whose "descriptions of his fruits and flowers were not those of a scientist but those of a nurseryman," "was seeking to emulate Darwin who was a lone worker for many, many years before making known the results of his labors." The reviewer knows of no evidence in support of such a suggested "bare possibility."

In a later chapter on "Burbank's place in the hall of fame," the statement is made that "Geneticists, a small but influential group of research men in our colleges and higher institutions, have always felt that Burbank was a stultifier of their science and that his bid for fame as a plant breeder was both impudent and absurd." The reviewer has had in-

The New ROSES FOR 1948

NEW ROSE SAN FERNANDO

Again, look to Wayside for the last word in beautiful new roses to make your rose garden more lovely, more permanent than ever. We've listed a few of them here.

San Fernando — long, pointed, bright vermilion buds; elegant, fully double scarlet flowers. Intense, lasting fragrance. All-America Selection for 1948.

Nocturne — deep, rich red with maroon shadings. Buds long and graceful. All-America Selection for 1948.

NEW ROSE NOCTURNE

Hill's Hillbilly — superb pink Floribunda, with the charm of a wild rose. Satiny, cup-shaped blossoms. One spray a bouquet in itself.

Hilltop — beautifully shaped. Deep capucine buff; edges toward pale, pinkish buff. One of Hill's finest. An aristocrat.

Bright Eyes — a continuous profusion of creamy yellow blossoms. Tips change to shimmering, silvery yellow.

Taffeta — a multicolored Hybrid Tea with begonia and carmine predominating; considerable yellow at base. All-America Selection for 1948.

Send for World's Finest Horticultural Book-Catalog

Almost 200 pages, with hundreds of flowers illustrated in their natural colors. Thousands of gardeners rely on this book year after year as their source book of ideas and the finest worth-while new plants. Complete cultural instructions for each item. To be sure you get your copy it is necessary that you enclose with your request 50¢, coin or stamps, to cover postage and handling costs.

Wayside Gardens

51 MENTOR AVE. • MENTOR, OHIO

timate and practically continuous relations with the geneticists of America from the very beginnings of this new science, and can not substantiate this statement. Burbank has been simply ignored by these because he was only an empirical plant breeder, not a geneticist. There is justification for calling him a "lone worker in the field of science," but this merely recognizes the latitude of meaning which inheres in the words "science" and "scientist," as used by various classes of writers.

The "conclusion of the whole matter" may be summarized in the words of the author that Mr. Burbank "is definitely entitled to a place in the hall of fame; but all factors duly considered, the best that I can do is to assign him a front seat among the minor prophets, a front seat because of the unusual fact that here is one prophet at least, who was not without honor among his home people."

The book closes with a brief bibliography, listing only the independent books dealing with Mr. Burbank's life and work; and with an excellent index.

GEORGE H. SHULL.
Princeton, N. J.

Field and Woodland Flower Guide

THE ILLUSTRATED ENCYCLOPEDIA OF AMERICAN WILD FLOWERS. Ethel Hinckley Hausman. 534 pages, illustrated, indexed. Garden City Publishing Co., Inc. 1947. $2.49.

This is a companion volume to the "Illustrated Encyclopedia of American Birds" by Leon A. Hausman and, like its associate, the book is country-wide in range, describing 1200 of our most representative American wild flowers, over 500 of which are illustrated with black-and-white drawings.

The approach to the identification of specimens is entirely through family characteristics. The manual opens with a short summary of the outstanding peculiarities of each family. This is followed by an alphabetical arrangement of families, under each of which the species are described beginning with the simpler forms and advancing to the more complex. Interspersed with the family headings is an alphabetical listing of common flower names with cross-reference to the families under which the descriptions appear, but without the convenience of page numbers.

Through repeated use of the initial section on flower families, the reader should gradually acquire a familiarity with family traits, which is most helpful in flower identification. However, for a novice in wild flower study, an added key would be advantageous in order to eliminate the time-consuming page-by-page search through all the family descriptions.

Sixteen full-page color illustrations by Tabea Hofmann give a helpful glimpse of the ecological and seasonal relationships of some of the flowers for various parts of the country.

Additional features of interest are a well illustrated glossary and listings of plants that need protection and those whose blossoms may be picked freely.

MARJORIE and WALTER SHANNON.

Arrow Poison and Drug

CURARE: ITS HISTORY, NATURE AND CLINICAL USE. A. R. McIntyre. 240 pages, 25 illustrations, index. University of Chicago Press. 1947. $5.

Students of medicine and biology have long wanted a concise monographic treatment of curare. Dr. McIntyre, chairman of the department of physiology and pharmacology at the University of Nebraska, has filled this need admirably.

Curare is a remarkable and powerfu drug used by South American natives as an arrow-poison. Various botanical components make up the many types of curare, and there has been much confusion in the past among pharmacologists because of the lack of uniformity exhibited by the crude material imported from South America.

Monographic work done at the New York Botanical Garden over the past ten years has largely cleared up the uncertainty about the identity of the plant involved. Medical men are now able to conduct experiments which are proving the considerable value of curare as a therapeutic agent. McIntyre presents a fascinating account of the famous naturalists who first braved the Amazonian jungles to obtain first-hand information about the drug and to observe the methods of its preparation by various Indian tribes. He reviews the work done on th botanical identification of these plants, and then discusses the chemical properties and therapeutic values, especially in the control and prevention of trauma in shock therapy and as an adjuvant in anesthesia. The book is extremely well documented with more than 1,300 bibliographic references. If one might offer any criticism of such a scholarly presentation it would be that the author stresses the menispermaceous sources of curare rather too intensively, and tends to underemphasize the sources in *Erythrina* and *Strychnos*.

H. N. MOLDENKE.

Cuba's Many Plants With Pharmaceutical Uses

PLANTAS MEDICINALES, AROMATICAS O VENENOSAS DE CUBA (MEDICAL, AROMATIC AND POISONOUS PLANTS OF CUBA). Juan T. Roig y Mesa. 2 volumes, 872 pages, illustrated, indexed. Ministry of Agriculture, Republic of Cuba. Havana, 1945.

The resurgence of interest in native pharmaceutical plants during the war years led Dr. Roig to write this book, which could be considered an elaboration of his "Diccionario Botanico de Nombres Vulgares Cubanos," which has been out of print for many years. In the preface the author states his objectives, one being to give the most complete and exact information on the medical and poisonous plants of Cuba. By careful compilation from the principal Floras of the American tropics and with a wealth of data personally acquired, Dr. Roig has well reached his goal. Anyone interested in the flora of the American tropics will find this a valuable reference book.

Roig's book is well organized and easy to use. Glossaries explain in Spanish the medical terms, pharmaceutical measures, and symptoms of the infirmities mentioned. Indices with ample cross references supply the common names used in Cuba, those used in other Latin American countries, and the scientific names for the plants mentioned. Two groupings of plants are given: one in which the plants are arranged according to the infirmities they treat, and the other placing them according to scientific names in the Engler-Gilg system under the families.

The bulk of the book consists of detailed descriptions of many plants arranged alphabetically under the Cuban common name. For each plant considered there are given the common and scientific names, notes on the habit and distribution, a complete botanical description, uses and applications, and complete bibliographic references. At the end of the book is a bibliography, arranged chronologically, of the Cuban pharmaceutical literature since 1767.

It is unfortunate that Roig has retained many American Code names taken directly from Britton & Wilson's Flora of Puerto Rico.

There are a few other disappointments in the book. Many of the plates are of herbarium specimens, and all 39 of the illustrations are very poor reproductions. Line drawings and zinc etchings would be much more satisfactory answers to the problems of paper and reproduction which every author faces when publishing in Latin America.

R. A. HOWARD.

Six-Legged Creatures And What They Eat

INSECT DIETARY. Charles T. Brues. 466 pages, illustrated, indexed. Harvard University Press, Cambridge, Mass., 1945. $5.

This excellent book serves two important purposes: (1) It gives the reader a full appreciation of the diversity of the food habits of the great class of insects, and (2) it gives the economic entomologist an excellent opportunity to realize that DDT and the other new insecticides do not occupy the entire field of entomology.

Every entomologist knows that the author is outstanding in his field and the comprehensiveness of the book is no surprise. This work covers an incredible amount of factual material presented in extremely interesting and readable style. It is impossible for the reviewer to summarize the contents of such a book in a limited space. Its chapters cover a survey of the abundance and diversity of insects, types of food habits, their relation to structure and environment, herbivorous insects, gall insects, fungi and microbes as food, symbiosis with microorganisms, predatory insects, parasitism, blood-sucking insects and other external parasites, entomophagous parasites, and other internal parasites and insects as food for man and other organisms. Each chapter has a bibliography and the book contains indices to authors and subjects. The reviewer values the foreword and introduction as masterpieces.

This book should be a "must" on the reading list of every student of biology. Regardless of how much one may know about insects this book will reveal something new.

BAILEY B. PEPPER,
Rutgers University.

Modern Treatise on Morphology of the Algae

STRUCTURE AND REPRODUCTION OF THE ALGAE. Volume II: Phaeophyceae, Rhodophyceae, Myxophyceae. F. E. Fritsch. 939 pages. 336 illustrations, 2 maps. Cambridge University Press. 1945. $15.

With the appearance of Volume II (delayed four years by the war), Professor Fritsch has given to botanists a monumental work on morphology, reproduction, and classification, with distribution notes, of the algae of the world. Not since the publication of Oltmann's famous compendium 25 years ago has anyone attempted to bring together such an array of information on this subject.

The text is based upon all the significant literature on morphology of the algae up to the latter part of 1941, when it was first completed. The literature was brought up to the middle of 1943, however, during the delay in publication caused by the war. The work is profusely illustrated with useful but unattractive line drawings and occasional photographs. The section dealing with brown algae is divided into chapters on the basis of orders, with a bibliography at the end of each. The treatment of the red algae, however, is divided into only three chapters, the introductory material, the subclass Bangioideae, and the subclass Florideae. This arrangement brings the literature of the large group Florideae into a rather unwieldy 21 pages of dense, unparagraphed references. The value of the bibliographies of the book in themselves is indeed great.

Professor Fritsch, who is professor of botany at the University of London, has produced the outstanding reference work of its kind in the English language, one that will be consulted by students of phycology for years to come.

HAROLD J. HUMM,
Duke University Marine Laboratory.

On Location in Colombia

EAST OF THE ANDES AND WEST OF NOWHERE. Nancy Bell Bates. 237 pages, illustrated, indexed. Charles Scribner's Sons. New York, 1947. $3.50.

Without discounting the influence of heredity and environment upon Nancy Bell Bates (who is the daughter of Dr. and Mrs. David Fairchild and the granddaughter of Dr. and Mrs. Alexander Graham Bell), this book is proof of her ability as an author and explorer in her own right.

As the wife of Marston Bates, she goes with her husband and assists him in his duties as a member of the staff of the Rockefeller Foundation. The book is written on location in Colombia, South America. It is the story of their home and how they adapted themselves to the customs of the country and what they saw as they explored the country round about Villavicencio.

The purpose of the book is achieved in the over-all picture of the jungles, llanos, and the plant life thereof. The people live as their ancestors lived, which is called "primitively" by reviewers. The study of mosquitoes and monkeys in their relation to yellow fever is a strong theme, but not a dominating one.

The style is entertaining and even whimsical at times. The author has been able to infuse her own youthful enthusiasm into her story.

EVA NOBLE,
Jacksonville, Fla.

Herbs Again

THE HERB GARDEN. Dorothy Bovee Jones. 40 pages, illustrated. Published by Mrs. C. Naaman Keyser, Plymouth Meeting, Pa., 1947. $1.

A Pennsylvania garden for the culture of herbs is described and uses are given for 25 different kinds of herbs. A plan for an herb garden is included, with sketches of several species recommended for the beginner.

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue surface car to Bedford Park Boulevard

Membership in
THE NEW YORK BOTANICAL GARDEN
and what it means

TO THE INSTITUTION, membership means support of a program that reaches several hundreds of thousands of persons annually.

Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

TO THE INDIVIDUAL, membership means, beyond the personal gratification of aiding such a program, these privileges:

Free enrollment in courses up to the amount of the annual membership fee paid.

A subscription to the Journal, to "Through the Garden Gate" and to Addisonia.

Admission to Members' Day programs and use of the Members' Room also at other times.

A share of plants when made available for distribution. (These plants may include the Garden's new introductions into horticulture.)

Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

Business firms may become Industrial Members of the New York Botanical Garden. Information on the classes of Industrial Membership and the privileges of membership will be sent upon request.

* * * *

Classes of membership in the New York Botanical Garden in addition to Industrial Memberships are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
Sustaining Member	25	Fellow for Life	1,000
Garden Club Affiliation	25	Patron	5,000
Fellowship Member	100	Benefactor	25,000

Contributions to the Garden may be deducted from taxable incomes.

Contributions to the Garden are deductible in computing Federal and New York estate taxes.

A legally approved form of bequest is as follows:

I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of*__________________

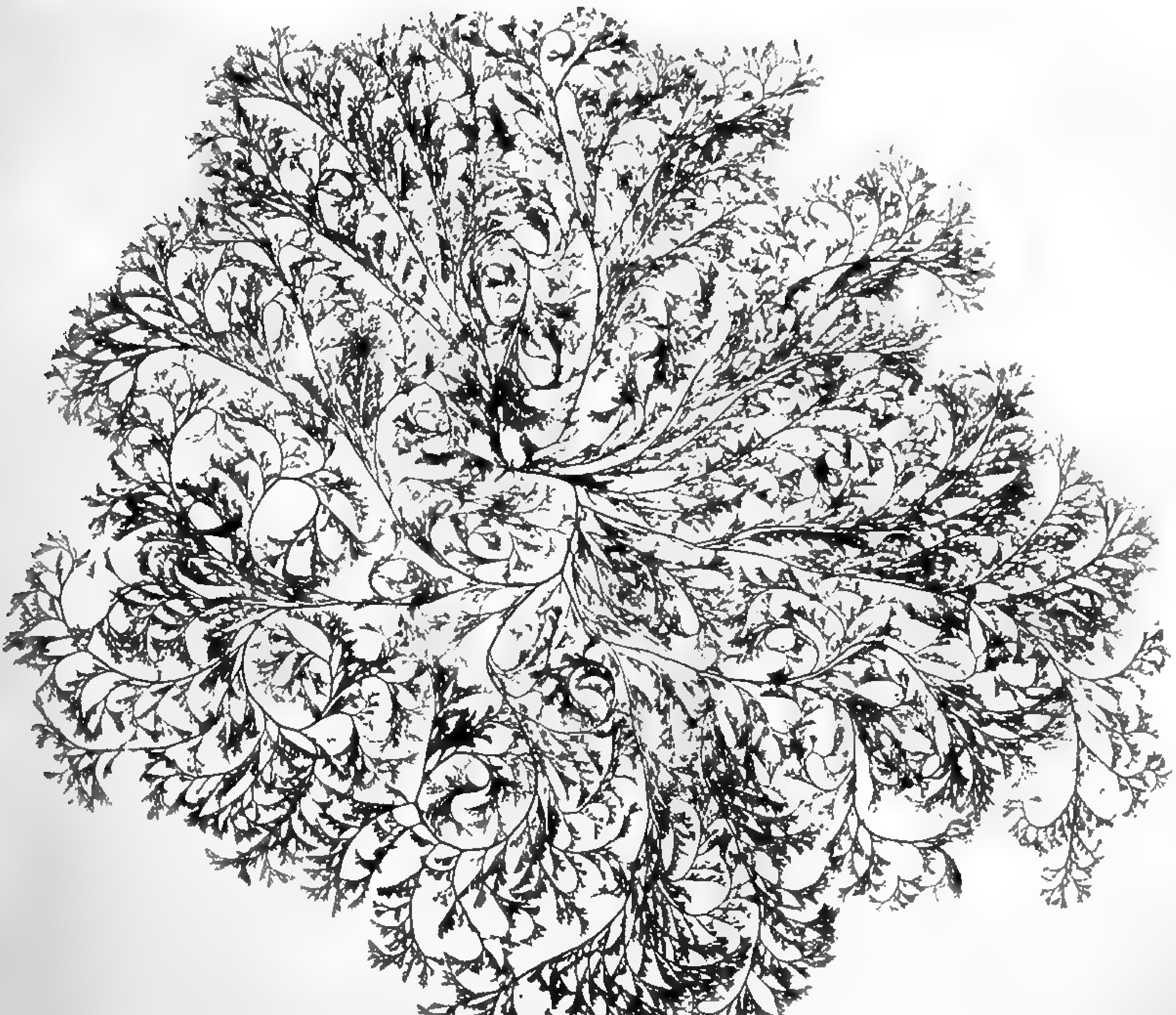
Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN



L. 49

. 578

FEBRUARY

1948

PAGES

25 — 48

FEBRUARY EVENTS AT THE GARDEN

Conservatory Display

Flowering bulbs, primulas, and cinerarias will be followed by butterfly-flowers (*Schizanthus*) in great variety and by South African annuals.

Museum Exhibit

Ornamental Algae (for description see page 32).

Members' Day

3 p.m. in the Members' Room

Feb. 4 *Some Orchids I Have Grown* — *Mrs. William K. du Pont*

Free Saturday Programs

3 p.m. in the Lecture Hall

Feb. 7 *The Romance of Tea and Coffee* — *William H. Ukers*, Editor, The Tea and Coffee Trade Journal

Feb. 14 *Berries and Small Fruits for the Garden* — *Edwin Beckett*, Superintendent Middletown Farm

Feb. 21 *Plants of the Bible* — *Harold & Alma Moldenke*, Authors of "Plants of the Bible" (in press)

Feb. 28 *"Garden Preparations"* and *"Transplanting Shrubs, Evergreens, and Trees"* — Two color films from Cornell University

Educational Program

Nature Study for Teachers

Fifteen sessions, Wednesdays, 4—6 p.m. Alertness credit for teachers
Feb. 18—May 26, 1948
Instructor *Dr. E E. Naylor* \$5
(\$2 to teachers)

Radio Programs

"Calling All Gardeners" every Saturday morning from 8:30 to 8:45 over WNYC.

Forthcoming Events

International Flower Show: Grand Central Palace, March 8-13. The Garden will have an exhibit of "Plants That Serve Mankind and Where They Originated." ***Member's Day***: Mar. 3, "Recent Horticultural Collecting in Puerto Rico" by E. J. Alexander ***Free Saturday Programs***: Mar. 6, "Food for New York's Birds" by Lorine Letcher Butler. ***Museum Exhibit***: Nature prints from grasses, leaves, and flowers.

TABLE OF CONTENTS

FEBRUARY 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York 5 N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription \$1.50. Single copies 15 cents.

JOURNAL

of

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VOL. 49 FEBRUARY 1948 No. 578

Seaweeds For Decoration

A Collector's Advice on How to Gather, Preserve, and Mount Marine Algae For Ornament or Study

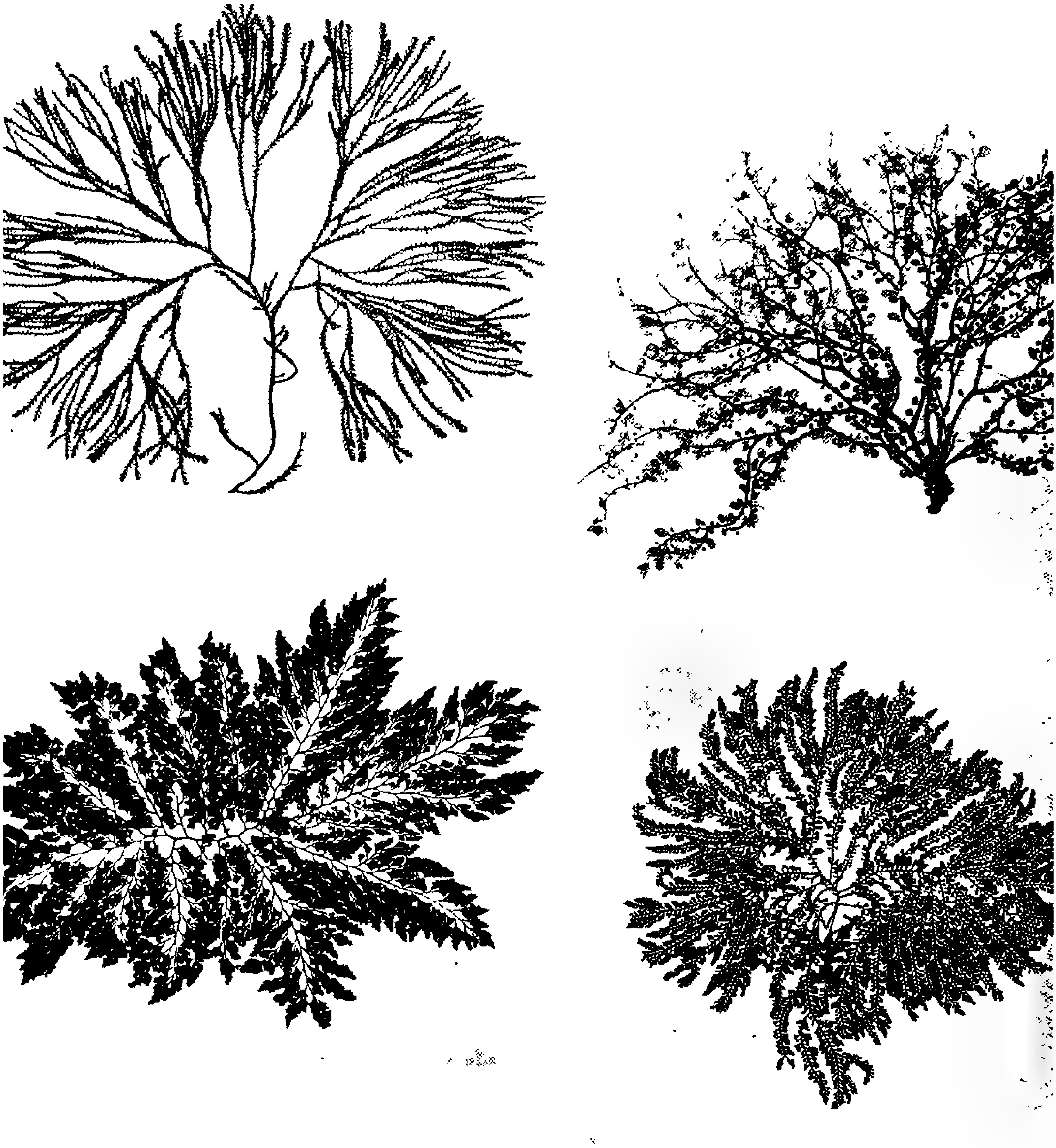
By Harold J. Humm

ONE of the expedients of the professional botanist that has been rather widely adopted by amateurs is the preparation of seaweeds on paper in the form of permanent mounts. To a professional, these are herbarium sheets made for the primary purpose of keeping seaweed specimens for an indefinite period and preserving as many of their natural characteristics as possible. To another, they may be purely a work of art, an interesting hobby, or a means of learning about the seaweeds of some region.

Strikingly beautiful mounts of seaweeds are so easy to prepare that anyone with some spare time and a little patience can produce gratifying results. Their distinctiveness of design, beauty of color, and often exquisite detail will arouse the interest of everyone who sees them, particularly when they are displayed on the wall in an appropriate frame. One who displays mounted seaweeds often has difficulty convincing his friends that the frame actually contains pressed seaweeds and not a carefully executed watercolor. The natural colors of these marine plants, although not permanent, will usually last a number of years if they do not receive direct sunlight.

Even those who make only an occasional visit to the seashore can make herbarium mounts. Seaweeds may be preserved in formaldehyde and, if kept in the dark, they will not fade for many months. The collector can then make the mounts at his convenience.

DR. HUMM is associated with the Duke University Marine Laboratory at Beaufort, North Carolina. In addition to the numerous papers on algae which he has published in recent years, he is the author of "Bacterial Leaf Nodules," an original study which appeared in the Journal of the New York Botanical Garden of September 1944.



ALGAE FROM THE EAST AND WEST

Above are two specimens gathered by the author from the coast of North Carolina: Bryothamnium triquetrum at the left and Chrysymenia uvaria, right. The two lower specimens from Pacific Grove, Calif., photographs of which are included in the New York Botanical Garden's Herbarium, bear notations in the handwriting of Dr. Marshall A. Howe, former Director of the Garden who was one of the world's authorities on algae. The dark purple Pterochondria (Pterosiphonia) Woodii is at the left. Of Pterosiphonia Baileyi (right) he wrote: "This dark-colored feathery or lace-like sea-moss is one of the most popular ornamental species of the California coast." The natural size of all these specimens is from two to three times the breadth of the illustrations.

Vital Statistics About Marine Algae

Seaweeds, or marine algae, include about seven principal plant groups (they should be called PHYLA) of which three—the red algae, brown algae, and green algae—are larger and more conspicuous than any of the others. Hence the term "seaweeds" usually refers to members of these three divisions of the plant kingdom. All seaweeds lack flowers, fruits, seeds, true roots, stems, and leaves. Of course, in the broad sense, they may be said to have stems, and some have structures that are remarkably like the leaves of land plants. They reproduce by single-celled bodies called spores. They also produce eggs and sperms but a fertilized egg cell does not develop into an embryo inside a seed and fruit, as it does in the flowering plants. In general, the structure and reproductive methods of algae are considered simpler and more primitive than the "higher" plants.

Most seaweeds can be separated into the three groups at sight, but there are many exceptions, particularly when the red algae are green, yellow, or brown in color. Actually, the groups are not separated on the basis of their gross color, but rather on structure, methods of reproduction, and pigments present (but not necessarily dominant). Thus all members of the red algae have a red pigment, but in some it may be masked by a preponderance of chlorophyll or other pigment.

In colder waters (north of Virginia), brown seaweeds are the most conspicuous, especially the kelps. In warmer waters, red algae predominate, and the greens are also more conspicuous and numerous. The brown algae are best represented in warmer waters by members of the genus *Sargassum* ("gulfweed"), characterized by spherical, berry-like floats or air bladders. Some species grow attached to rocks along the shore, but the greatest abundance is to be found in the Sargasso Sea and Gulf Stream, where they are never (or rarely) attached to anything solid.

The variety of seaweeds in any given region is so great that years of gathering specimens are necessary before a collection approaches completeness. Since many species are seasonal, certain ones are found only in summer, others only in winter. About 400 species have been reported to occur along the shores of the northeastern states, about 200 off North Carolina (names of some of these have not yet been published), and more than 400 have been found in Florida. Many species present in New England extend as far south as North Carolina, particularly in winter, while many species found in Florida grow as far north as North Carolina, especially in summer. A few are found along the entire Atlantic coast of the United States. There are probably over 750 species between Maine and southern Florida.

The Technique of Collecting

The seaweed collector should be equipped with a bucket, jars for keeping small or rare specimens separate, wading shoes if the water is warm, or hip boots if the water is cold. Too much warning cannot be given against slipping on rocks and against getting cut on the razor-sharp edges of oysters and barnacles. A heavy cloth bag with shoulder straps is often useful, as the collection will keep fresh in it for some time and it is easy to carry over terrain that may at times require two free hands. If the specimens are to have any botanical value, each must be labeled as to place and date of collection, habitat, and collector's name. Penciled notes can be placed in the water with the seaweed.

Along the coast, most seaweeds grow attached to solid objects, some between high and low tide lines, others below the low tide level. Rocks, breakwaters, and shallow flats littered with stones and shells make the best collecting places, but successful collecting can be done at such places only when the tide is low. Collections can be made at times with rising or high tide along beaches, especially after strong winds, but the collector should be careful to include only fresh, living material. Most seaweeds that wash ashore are worthless.

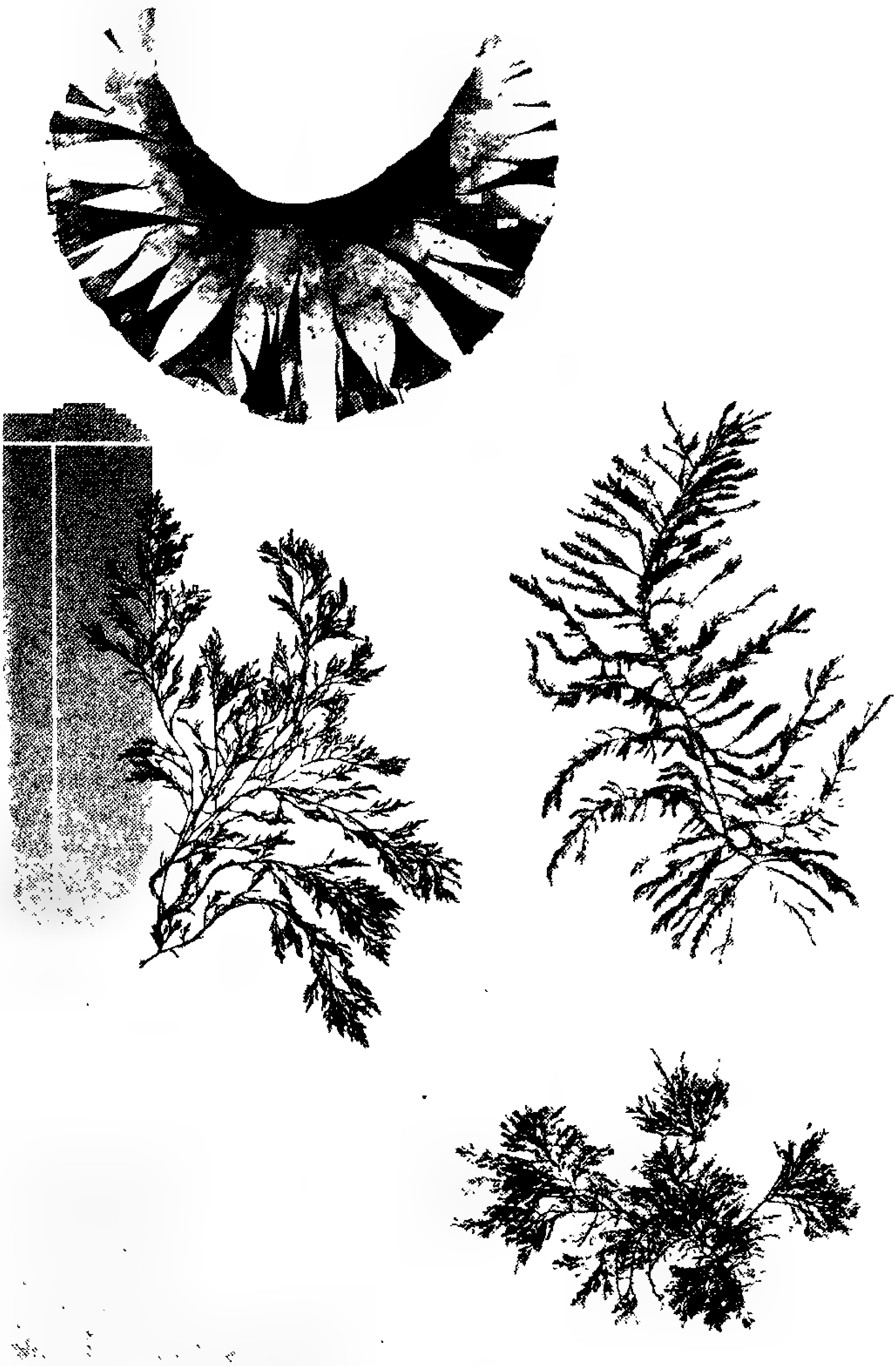
Tidal data usually are available in newspapers of coastal towns. Lowest low tides of the month along the Atlantic seaboard occur immediately after new and full moon, when there are two or three days of below-average lows. In general, low tide occurs 45 minutes later each day.

Materials Needed by the Collector

A plant press of some sort, good quality mounting paper, a shallow pan, some good waxed paper, a medicine dropper, dissecting needle, and some sea water are about all that are needed to begin. The press is composed of plant driers (a heavy grade of blotting paper), newspapers, and a board or slat frame for the top and bottom. The driers may be obtained from scientific supply companies, or ordinary desk blotters may be cut in two and used instead. The press may be identical with those used for land plants, although weight on top is better than straps. Cardboard ventilators are not necessary unless a large number of specimens are placed in the press at one time. The disadvantage of using them is that the corrugations tend to impress themselves into the specimen sheet rather permanently if sufficient weight or pressure is applied to obtain a good result. Single newspaper sheets, folded in the center and used the same as when drying land plants, help to keep salt water out of the blotters. Waxed paper of good quality is essential. Two brands found suitable are "Waxtex" and "Cut-Rite."

Herbarium paper can be obtained from scientific supply companies, or suitable paper can be bought at any print shop by asking for rag content ledger paper of 72 pound substance or slightly heavier, or index paper of the same weight. Ledger paper, however, is better. Full-sized herbarium sheets are 11.5 by 16.5 inches, but botanists frequently use half or quarter portions, according to the size of the specimen.

The pan or tray in which mounting is done should be two to four inches deep and of such dimensions that the largest sheet desired will lie flat in



MINIATURES FROM MARTHA'S VINEYARD

These small, delicate specimens of seaweed, according to Marshall Shepard, Curator of the Dukes County Historical Society at Edgartown, Massachusetts, "were mounted by one of our ladies about 1890."

it. White enameled pans are preferable. Seaweeds should always be mounted with sea water in the tray or in tap water containing about three percent table salt. In fresh water, many species become mushy and lose their color quickly.

Material that cannot be mounted within a few hours after collection should be preserved by adding one part formaldehyde (U. S. P. 40 percent, obtainable at drug stores) to 24 parts of sea water. Preserved material should be stored in darkness as soon as possible.

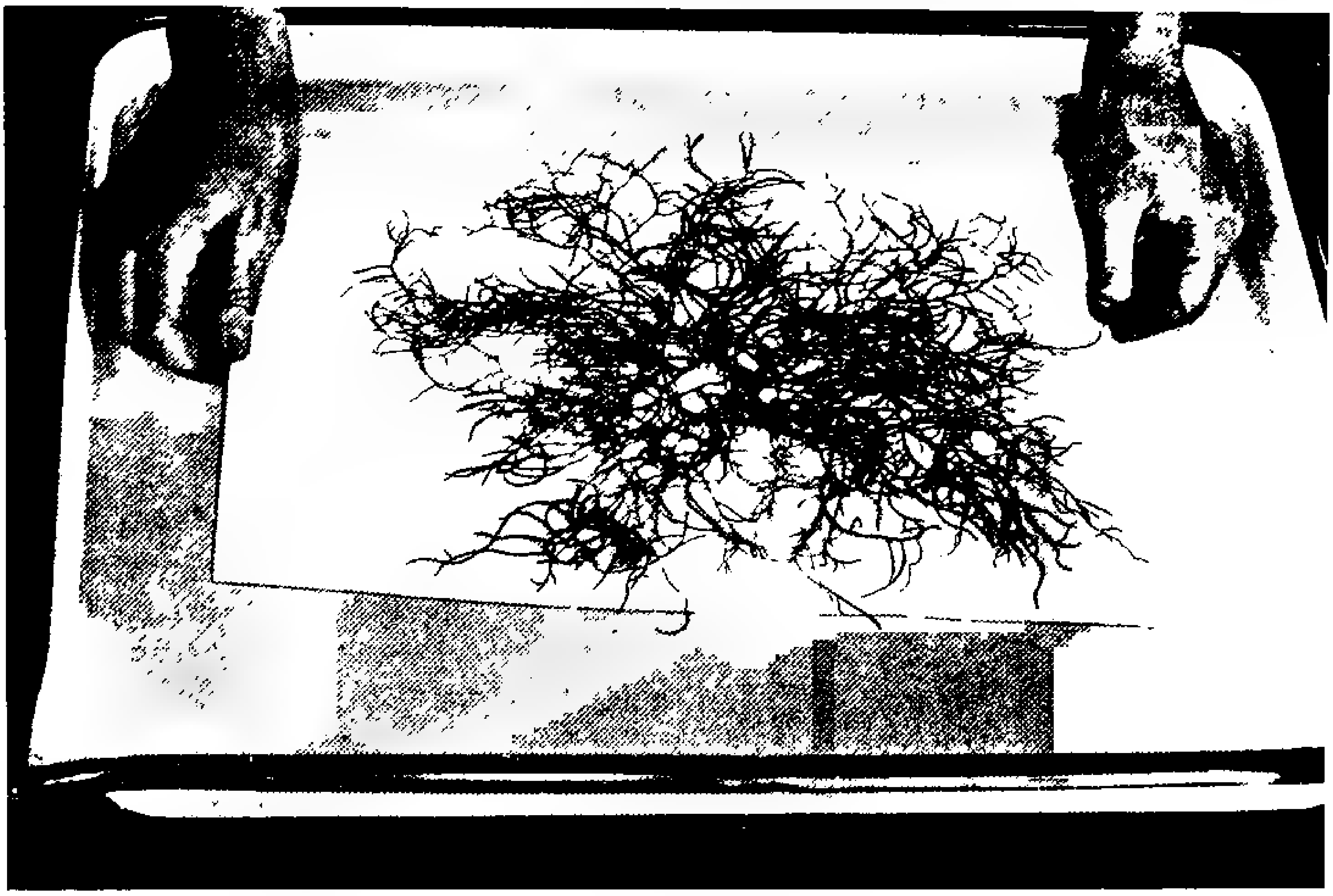
The Mounting Procedure

Since most seaweeds will adhere to paper by virtue of their own gums, if properly pressed, only occasionally does the collector have to glue them down later. If the mounting and pressing are properly done and the specimens carefully handed, little difficulty will be experienced with non-adhering mounts.

Water in the mounting pan should be about an inch deep. The specimen to be mounted should first be dipped several times in sea water to remove loose particles and then placed in the mounting pan. The paper, with penciled data at the bottom if desired, should be plunged into the water edgewise and under the specimen. It is best to wet the entire surface of the paper immediately to prevent warping. The seaweed should be centered on the paper and arranged to look natural. Paper and specimen must then be lifted carefully from the pan. Some collectors use a thin board or piece of slate under the paper, but the operation can be done simply by placing one hand under the paper at the center of the specimen and slowly lifting, letting the water run off at all sides. If this is done cautiously, the specimen will not be seriously disarranged.

Final arrangement is accomplished with the paper on a flat, clean surface, using whatever implement the situation suggests. A medicine dropper is handy. Drops of water on portions of the specimen, especially if the paper is tilted a little, will often cause branches to fan out. Foreign particles can be washed off. A dissecting needle is often necessary to arrange branches. Sometimes a camel's hair brush is useful. Another expedient is to hold the paper at an angle and dip various portions of it gently into the water. As it is withdrawn, branches of the seaweed usually assume a natural and attractive position. Much of the beauty of the finished specimen depends upon the care exercised at this stage of the work.

When the arranging is completed, a sheet of waxed paper of the same size as the specimen sheet should be applied, beginning at one end. With delicate seaweeds, further arranging can be done by gently tapping the waxed paper over the branches. The specimen sheet should be held by one corner for a short time until excess water runs off. It is then ready for the press.



How to float a seaweed over the mounting paper in a porcelain tray is shown above.

Two plant driers or at least three layers of desk blotter should be placed on a board of the same dimensions. A single newspaper sheet folded at the center should be placed on the blotters and the specimen placed within the newspaper. Two or three blotters should then be added and another newspaper for the next sheet. This will retain most of the salt, so that blotters can be dried more readily for re-use. When the last specimen is mounted and placed in the press, a board or slat frame should be placed upon the pile and considerable weight added. Two concrete blocks may suffice. Professional botanists often prefer less weight than this, but for artistic purposes, most species require heavy pressing. Blotters should be changed not later than two days after the specimens were mounted and again at the end of a week. Usually two weeks are required before the specimens are dry enough to remove from the press, unless artificial heat is employed. Blotters should be thoroughly dried before re-use.

It is best not to attempt to remove the waxed paper from the specimens until they are thoroughly dry. The paper should then be peeled from the base of the plant upward toward the outer branches by pulling the edges of the paper directly forward to avoid a lifting effect. Should the specimen begin to lift from the paper, it should be held down at this point and the peeling cautiously continued. There is considerable variation in the tendency of seaweeds to stick by their own mucilage. Some must be glued down when dry.

Some botanists use muslin or gauze instead of waxed paper, especially for the coarser seaweeds and for flat, gummy species. Gauze or other cloth often leaves an imprint on the specimen. Waxed paper can be used for all types of material.

Identification of the Specimens

Anyone who prepares more than a few seaweed mounts for decorative purposes will want to know the correct names of what he collects. Marine algae of the Atlantic Coast are included in one or more of three works: "Marine Algae of the Northeastern Coast of North America" by W. R. Taylor, "Marine Algae of Beaufort, N. C., and Adjacent Regions" by W. D. Hoyt, and "Marine Algae of Florida" by Taylor. The latter two are out of print, but can be consulted in botanical libraries. All three are well illustrated and contain keys. Technical terminology will baffle the beginner and make necessary frequent reference to an unabridged dictionary. Hoyt's paper includes a useful glossary.

The Pacific Coast algae are thoroughly treated in "Marine Algae of the Pacific Coast of North America" by W. A. Setchell and N. L. Gardner, and by the more recent "Marine Algae of the Monterey Peninsula" by G. M. Smith. Smith's book contains a glossary, a workable key to the genera, and excellent illustrations. A recent publication by Maxwell S. Doty in *Farlowia* for January and July, 1947, deals with the marine algae of Oregon. The periodical is available from Harvard University.

Seaweeds on Exhibit

ORNAMENTAL algae will be exhibited in the rotunda of the Museum Building at the New York Botanical Garden during February. In addition to the highly decorative red algae and others from the California coast, some of which have appeared in previous exhibits of the Garden, there will be examples from a newly acquired set of 300 specimens of freshly collected and mounted algae from New Zealand. These differ considerably in form from the California group. There will also be some miniature mounts of seaweeds from Martha's Vineyard, which have been sent on loan to the Garden through the courtesy of the Dukes County Historical Society at Edgartown, Mass.

The exhibit of algae will later go to the Garden Club of America, which will place the specimens on display for the summer in the new headquarters to be opened shortly in the penthouse of the Hotel Madison, 58th St. & Madison Ave., New York City.

How Rhipsalis, an American Cactus, May Have Reached Africa

By Harold E. Anthony

THE Cactus family (Cactaceae) is usually regarded as a group confined to the Western Hemisphere. Succulent plants very much like cacti in general appearance grow in Africa, but they belong to the Euphorbiaceae. True cacti are absent from an environment that seems made to order for them. Several species of *Rhipsalis,* however, a cactus of epiphytic habit, have been reported from scattered localities in Africa, nearby islands, and even from Ceylon, and for many years these have been a puzzle to botanists.

Rhipsalis in an African Rain Forest

In 1946 I saw *Rhipsalis* in Nyasaland.[1, 2] It was September, and Len Brass and I were camped on Cholo mountain. This region lies in a belt of heavier rainfall than most of Nyasaland and there are extensive tea plantations on the plains and part way up the flanks of the mountain.

Cholo mountain rises to an elevation of some 5,000 feet and the upper part of the ridge is heavily clothed with rich vegetation. The trees are tall and their branches carry masses of vines, ferns and epiphytic plants. The strangler fig has taken possession there and is the dominant element, at least at the southern end of the range. A giant *Dracaena,* with a trunk reaching four to five feet in diameter, is a conspicuous feature of the forest. But the fig trees, with their many interlaced structures favoring the lodgment of epiphytes, were responsible for calling our attention to *Rhipsalis.*

Len Brass and I, on our preliminary survey of this attractive environment, had been studying the wealth of plant life loaded on the limbs and in the crevices overhead. These intriguing collections were too high above the ground for us to reach, and not even the trained native tree climbers who accompanied Brass could scale these big trees. We wondered how we could get a close look. Luck was with us for we soon encountered a fallen giant and the ground was strewn with the things we wanted to see.

---

[1] As a member of the Vernay Nyasaland Expedition of the American Museum of Natural History, I spent from May to October in this region. Mr. Arthur S. Vernay, the leader of the expedition, is greatly interested in plants and the New York Botanical Garden was represented by Leonard J. Brass. Though my primary interest is in mammals, I study cacti and succulents as a hobby and grow what I can in a small greenhouse. I have been especially interested in the genus *Rhipsalis* and have cultivated many of the species available in the American trade. I was, therefore, particularly pleased when we discovered Rhipsalis in a rain forest in southern Nyasaland.

[2] An illustrated report of the Vernay Nyasaland Expedition by Leonard J. Brass will appear in the Journal this year.

Throughout the stay in Nyasaland I had my eyes peeled for succulents and also had a pretty good idea of what I might expect to see. It had not entered my mind that *Rhipsalis* was a possibility because the localities I had seen reported in literature were on islands or near the coast. It came as a great surprise to see clumps of what resembled *Rhipsalis cassutha* in the rich epiphytic flora of this forest.

The fallen fig tree provided a fair number of small to medium plants carrying a few flowers and scattered fruit. While the plants were thrifty, I would not term them luxuriant. To judge from what we could see from the ground, *Rhipsalis* is pretty well established in the forest canopy of Cholo mountain. We noted it growing also on a huge rock associated with sparse clumps of small ferns and some moss. The rock was not a very congenial site, however, and the plants of *Rhipsalis* were small, the stems reddish from the sun. Probably the occurrence of this cactus on the rock could be attributed to birds, because we saw no plants overhead or nearby.

Some days later we found *Rhipsalis* on the limbs of *Brachystegia,* an open forest type of tree, a species associated with much drier environment than that of the rain forest. *Brachystegia* is deciduous and the discovery of *Rhipsalis* in this drier, more open environment demonstrated the adaptability of this epiphytic cactus. This locality was not more than a mile or so from the rain forest of Cholo and it was probably another instance of bird transport from the humid, shaded colonies of *Rhipsalis* there.

A third location for the epiphyte was in the gallery forest along the shallow ravine of the Nswadzi River, perhaps three miles as the bird flies from Cholo rain forest and a thousand or two feet lower in altitude. In this narrow strip of forest there were occasional fair-sized fig trees. The boughs of these trees were well shaded and on one of them I found an exceptionally large and happy plant of *Rhipsalis.* It was not very far up on the tree and I sent one of our boys up to collect it. I took pictures of the plant both *in situ,* where the poor light and adjacent foliage made it inconspicuous, and after it was brought out on the road. This environment, although shaded and not as dry as the flats on either side of the river, was still quite different from that of the rain forest, which would appear to be a center of dispersal for these marginal colonies we encountered.

Specimens of these plants are now in the New York Botanical Garden.

Where Did They Come From?

How did these plants of *Rhipsalis* —or their ancestors—get to this inland forest in Nyasaland and to other sections of Africa and adjacent Asia?

In an article which was originally published in volume 59 of the *Bulletin de la Société Botanique de France* (1912), translated by Elizabeth G. Britton and published in *Torreya* in 1913, then recently resurrected and reprinted in *Desert Plant Life* (October 1947), R. Roland-Gosselin pre-

An American Rhipsalis on an African fig tree, found by the author in a shallow ravine of the Nswadzi River during the Vernay Nyasaland expedition of 1946.

sents a very good case for considering the species of *Rhipsalis* discovered in Africa as direct imports from America, with migratory birds as the carriers. In this translation there is an initialed footnote by Nathaniel Lord Britton saying: "M. Roland-Gosselin's bold explanation of the occurrence of these *Rhipsalis* species of Cactaceae in tropical Asia and Africa, the family being otherwise American in distribution, is an important contribution."

Further, Britton and Rose, in "The Cactaceae" (Vol. 4, p. 220, 1923), accept without comment this means of transport, but the assumption of the French author that the first seeds were brought from America by migratory birds does not rest upon very secure grounds, and it raises difficulties on two important points.

The Routes of Migratory Birds

First, what land birds migrate from America to Africa? None of the frugivorous species of birds cross the vast expanse of ocean which lies between the West Indies (or continental America) and Africa. The entire pattern of bird migration (excluding oceanic species) and the philosophy which accounts for it calls for a north-south axis. Land birds do not cross great oceans east and west on a voluntary, migratory urge. On rare occasions stray individuals find their way across, usually as the result of storms. It is therefore necessary to consider such a random visitor as the transporting agent, but "migratory birds" are definitely not a factor in bringing *Rhipsalis* directly to Africa.

Historic or Geologic Time

Of second consideration is the matter of time. Naturalists can cite many instances of the important part played in the distribution of species by waifs which reach a new environment. Many oceanic islands receive their animal population in this manner, and the evolutionary pattern in such instances gives clues as to the time of arrival of these strays. If the introduction took place in geologic time, as opposed to historic time (time for which there is a written record), almost invariably there is marked differentiation from the original stock as it is known by its continental representatives.

Moreover, if *Rhipsalis* could reach Africa via a stray bird from America, presumably this could have happened not only recently but also countless years ago. Furthermore, if this could happen once, the probabilities favor the occurrence more than once because of the vast extent of time which enters into the problem. If these conclusions are correct—and the theory of island faunas and floras supports them—we should expect the African species of *Rhipsalis* to show varying degrees of differentiation from their New World relatives. The earliest arrival in Africa should be decidedly different because in America the passage of geologic time has operated to produce a host of distinct forms.

But the African specimens of *Rhipsalis* all are either identical with or so similar to American species that they must have reached Africa but yesterday, as time should be reckoned in this connection. We reach the inescapable conclusion that *Rhipsalis* must be entirely American in origin; that its presence in Africa is an accident and not a result of the natural factors which control world distributions. I am excluding man as one of these natural factors.

Bird Supplementing Man

There is a theory which accounts for African *Rhipsalis* which seems to me to eliminate the obstacles I have cited. Some of the species of *Rhipsalis* have been well known for a great many years. For example, the species *cassutha*, which in the New World occurs from Florida southward and is also the commonest form in Africa, appears in literature in 1768. I suggest that man himself brought the first *Rhipsalis* (plant or seed) to Africa and that from this introduction the birds, in this instance migratory ones, have spread the seeds. The localities in Africa from which *Rhipsalis* is

The same plant of Rhipsalis, removed from its lodging on the forest tree.

reported accord well with this postulate. African migratory birds can easily distribute the seeds of *Rhipsalis* along the southeast coast of Africa and the adjacent islands, but it is asking too much of worn out wanderers from America. These must either beat their way around the Cape or across the Kalahari Desert or some similarly inhospitable expanse to reach, for example, Madagascar.

Man moved many plants around the world in the early 1800's. It is reasonable to argue that he brought *Rhipsalis* to South Africa. Even if he brought it only to southern Europe, he presented an opportunity for the Old World migratory birds to transport the seeds. Considerable speculation along the avenues thus opened might be advanced, but these are left to the reader. My thesis is that it is more logical to postulate man as the transporting agent from America to the Old World than to bring birds into the problem. The theory of birds carrying *Rhipsalis* directly from America creates more questions than it answers.

Margarine and Its Constituents

By George S. Jamieson

SINCE the first oleomargarine was developed in France around eighty years ago, the product has undergone mutations which have elevated its status from that of a substitute for butter to one of recognition for its own value. Also it has changed from a purely animal product to one which, in America at least, is derived principally from the fats and oils of plants.

Its origin in France was stimulated by a prize which was offered by Napoleon III for an agreeable substitute for the expensive butter that the French liked so well to use in their cooking.

If the monarch seems to have had the common man and woman in mind, in urging a cheaper table fat to be produced for them, it was largely because of his need for capitalist support. He was unable to get the support of either the working class or the aristocracy, so he made it his policy to encourage industry in every possible way, offering subsidies, decorations, and awards. His prize for a butter substitute was won in 1870 by Mèges-Mouries, a chemist, for a product which he named "oleomargarine," and made principally from the softer part of beef fat.*

---

* This was done by mixing casein separated from milk with "oleo-oil" to give the product a consistency similar to that of butter. Oleo-oil, which is a soft solid fat at ordinary room temperatures, is obtained by fractionating beef fat. It is melted and held at about 30° C. (86° F.) for two days or sometimes longer to permit as completely as possible the crystalization of the oleo-stearine. Then the mixture is placed in cloth bags made for this purpose and gradually pressed in presses maintained at the same temperature as the fat, in order to separate the oleo-oil from the crystals of oleo-stearine. This fractionating of animal fat is known technically as graining, but when applied to vegetable oils, it is called "wintering," because before the days of artificial refrigeration it could be done only in the winter time. A few years after the invention of margarine is was made by churning the fat with milk. Also later a fine grade of neutral lard was used along with the oleo-oil for making margarine.

As early as 1875, some of this new butter substitute was being manufactured in the United States, and in 1876 Congress passed the well known Oleomargarine Act, which to producers and dealers just outside the dairy industry, and also to consumers, still is creating problems and difficulties. In its present form, heavy license fees which have to be paid by manufacturers, wholesale dealers, and retail stores are piled on top of the Federal tax of a quarter of a cent a pound for uncolored margarine and ten cents a pound for colored.

Until about thirty years ago, beef fat remained the principal source of oleomargarine. At that time, refined, deodorized coconut oil, usually along with small quantities of peanut oil, was first used in the production of a margarine containing no beef fat. Coconut oil maintained its dominant position as the chief margarine oil for many years. In the meantime, however, intensive experimentation was undertaken on the part of the manufacturers' chemists, not only to improve the physical properties of the finished product but also to make possible the substitution of domestic vegetable oils for the coconut oil. The coconut oil margarine was too hard to spread below 55° F. and never maintained its shape in hot weather, as it melted at about 80°. In spite of years spent upon improving its physical properties, little of practical value was accomplished. This result probably stimulated efforts to find how to treat our own vegetable oils so that they could be used in place of coconut oil.

The notion that American dairy farmers were forced to market their butter in competition with margarine made with a foreign oil may have been another factor for consideration in this matter. Finally, the chemists succeeded in hardening these edible liquid seed oils by the so-called selective hydrogenation process, with the result that margarine made with them had far superior physical properties to any previously produced. Consequently, for some years now, coconut oil has been displaced by cottonseed, corn, peanut, and soybean oils. In Europe excellent margarine is also made by using refined whale oil.

For the manufacture of margarine from vegetable oils, the first step is to inoculate pasteurized, cooled skim milk with lactic acid bacteria and to hold it at 20° C. (68° F.) until the butter flavor has been fully developed. The specially hydrogenated oil or mixture of the oils already mentioned is emulsified with the so-called "ripened" milk, using a homogenizer or other equipment designed for this purpose. The emulsion is suitably cooled and kneaded to a homogeneous mass. Any excess of moisture separated from it by this treatment is removed. After incorporation of salt and other minor but important ingredients, not previously added, the margarine is ready to be cut into pound prints and packaged for distribution. During recent years equipment has been made available which makes the manufacture of margarine almost a continuous process.

The "minor ingredients" to which reference has been made include emulsification aides, stabilizers, and anti-oxidents which improve the keeping quality. For these purposes monoglycerides of fatty acids and soybean lecithin (a complex waxy substance) are used.

Addition of vitamins A and D to enhance the nutritional value of margarine began over twenty years ago, but since about 1937, when a better-flavored concentrate—sometimes containing as much as a million or more vitamin units per gram—became available, much larger quantities have been added. The vitamin content, in fact, is more reliable than that in butter, because it is high and constant the year around, whereas the vitamin content of butter is lower in winter, when it is needed most.

The preparation used in the home to color margarine is the same one used to augment the color of pale butter before marketing.

The manufacture of the ingredients and of the margarine itself is conducted under laboratory control, and the equipment as well as the factories are all kept scrupulously clean. As now made, margarine is not a substitute product, but one which stands alone on its own merits.

It has been well said that margarine today is custom-built to keep up with the progress of nutritional science.

Liquid Manure from a Spigot

A Description of a Convenient, Home-Made Device

By Katherine G. Fenimore Cooper

LAST summer visitors to our garden completely overlooked the unfamiliar flowers which are my special pleasure, to observe a labor-saving device of my own origination which they immediately went off to copy for themselves. It is, I think, the perfect solution to the liquid manure problem. Here is how it is made.

Have a spigot soldered into the base of a galvanized ashcan of 5 or 10 gallons capacity. Place the can on a bench near a water tap, for convenient refilling. Suspend a bag of manure from a strong rod (which can also be soldered in, if preferred) across the top; fill with water and replace the cover. Set a watering can below the spout, and presto! Liquid manure is at hand to apply whenever needed, with very little effort, no odor, and nary a fly. An extra can or two fixed in this manner may prove useful.

This efficient contraption is equally convenient for keeping on hand, already mixed, the different sprays that one too often needs. I pass the idea on to others in the hope it will lessen their labors and make them pleasanter, as it has mine.

NOTICES AND REVIEWS OF RECENT BOOKS

Guide for Eastern Fern-Lovers

FERNS OF NEW JERSEY. Mintin A. Chrysler & J. L. Edwards. 201 pages, illustrations, glossary, list of references, index. Rutgers University Press, New Brunswick, N. J., 1947. $4.

Here in a concise, easily handled book are to be found all the ferns and so-called fern allies in New Jersey, brought up to date as regards nomenclature, distribution, and species. Even the problem of the once much disputed hybrid spleenworts is settled.

Both Dr. Chrysler and Mr. Edwards, with their years of experience in field work, one from the standpoint of the professional botanist, the other from that of a layman, are fully qualified to write an authoritative book on their chosen subject.

This book opens with a short account of the general structure and life history of a fern plant, accompanied by drawings explaining the terms used so that even a beginner should have no trouble in recognizing structures.

The authors briefly review six important factors which determine the distribution of the 48 species of true ferns found in their state, a large number for such a small area. New York State with six times the area has only 50 species—but, as the authors show, only the northern part of New Jersey was glaciated. The unglaciated southern area provides a rich contrast. Interest in these factors is heightened by the distribution maps which accompany the individual write-ups of species. May we venture to hope that some of the rarer plants will not suffer too much from "vandalism" among the professional and non-professional fern lovers, now that their habitats can be located more easily.

How often has someone been heard to say, "If only the botanists would stick to one name for a plant!" The old bugbear, nomenclature, creeps into this small volume, as it must into any such work. We had long since become reconciled to the loss of *Pteris aquilina* in favor of *Pteridium latiusculum*. But wait—now we must call this same fern *Pteridium aquilinum* var. *latiusculum*. It's all there. Then there's *Athyrium* or *Asplenium* for the lady-ferns (northern and southern) and the silvery spleenwort. Which shall it be? The former wins the day, but with new species names attached! It is our sincere wish that this book will do much towards helping to stabilize the Latin names used in the Pteridophytes.

The keys, both to the orders and the families of the ferns, horsetails and club mosses, are clear and easy to use, calling only very occasionally for the use of a hand lens for such characters as the indusium and the annulus. The book is well illustrated, with every species description except for the quillworts accompanied by one or more photographs.

This volume should be a joy to all fern lovers of this general area.

HETTIE M. CHUTE,
New Jersey College for Women.

Bulb Culture with Enthusiasm

BULBS FOR BEAUTY. Charles H. Mueller. 296 pages, illustrated with drawings by Else Bostelmann and with photographs; indexed. M. Barrows & Co., 1947. $3.50.

This book comes at a time to fill in some of the gaps in our supply of gardening literature. This lack is a sad one. So many of our favorites, scarce because of wartime conditions, are perhaps beyond recall. We gloat over them if we are lucky enough to possess them. If we do not, a rare-book specialist may still find them for us—or they *may* be republished later. In the interim, however, as always, we need books up to date in content, up to date in treatment.

This book by Charles H. Mueller is a very pleasant one, with a light-hearted outlook on the subject, especially of the lovely tulips, the daffodils, the hyacinths and their company, now coming to us in new varieties from the brave Netherlands and our own nurseries.

The author brings also to our attention many other bulbs beside these "winter freeze" ones. Here are the kinds which we must plant out in spring or summer and take up before frost puts an end to their outdoor work. He includes many rather rare with us, such as *Sparaxis, Gloriosa, Ismene* or *Hymenocallis,* and *Cooperia,* also some late blooming ones, which may be left in the ground over the winter, such as *Colchicum* and *Sternbergia,* autumn crocus, and the not-so-late bloomer *Lycoris squamigera.* With some of the bulbs are cute little sketches of the flowers, and there are some charming photographs.

Mr. Mueller takes up indoor flowering, and beside the tulips and their cohorts, he gives us also the rarer ones—*Amaryllis (Hippeastrum), Bletilla, Lachenalia, Ornithogalum* and others, including the promising *Veltheimia.* He considers woodland plantings, rock garden bulbs, bulbs for a white garden. He includes what is grand for the amateur, a glossary.

One may question a little the inclusion of tubers and tuberous roots with the bulbs, but the difference is clearly explained and makes it possible to treat here the dahlias and tuberous begonias. Some varieties of bulbs are included which are doubtfully hardy in the north but do well in the south and in California.

A little botany is introduced and soil and planting are included. While it is an excellent book for the beginner, commercial men and more advanced gardeners also will like it, especially for the varieties and species he includes.

Lilies are divided by blooming times and to each one is added a statement as to whether it is stem- or base-rooting.

This is a book one will turn to often for the brief descriptions, but even more for the author's cheerful, loving feeling for bulbs so plainly shown in his writing.

SARAH V. COOMBS.

Out of the Past Century

GEORGIA'S PLANTING PRELATE. Hubert B. Owens. 56 pages, bibliography. University of Georgia Press, Athens, Ga., 1945. In paper, $1.25; cloth; $2.

First publication of an address on horticulture that was given at Macon, Ga., in 1851, by the Right Reverend Stephen Elliott, Jr., son of the noted southern botanist, is preceded by an interesting historical and biographical sketch by the present Professor of Landscape Architecture at the University of Georgia. The address itself summarizes the horticultural status of the state as of 95 years ago, and offers suggestions for improvements, many of them still needed today.

E. J. ALEXANDER.

Discoverer Rediscovered

MAYA EXPLORER — John Lloyd Stephens and the Lost Cities of Central America and Yucatán. Victor Wolfgang Von Hagen. 324 pages, illustrations, chronology, bibliography, index. University of Oklahoma Press, 1947. $5.

First American to explore the remains of the ancient Maya cities, John Lloyd Stephens, in his several volumes on travels in Central America, Chiapas and Yucatán, wakened the western world to its own past with description fresh even today.

Dr. Von Hagen, in "Maya Explorer," has told and retold the story of this accomplished traveler, writer, diplomat and business man in a manner informative to those already aware of Stephens' writings and stimulating to the uninitiated.

Von Hagen has reconstructed (sometimes overly so, one judges) the boyhood and youth spent in New York and, with Stephens' accounts as a guide, has outlined his travels in Europe, Asia Minor, Arabia and Egypt, where his studies of antiquities commenced.

Fired by hints of America's lost civilizations, Stephens, accompanied by Frederick Catherwood as artist, visited the Maya ruins, recognized the essential homogeneity of culture, noted their magnificent workmanship, and described them in vivid fashion.

Then, having roused the world with these mysteries, he embarked on his last great venture — to cross the Isthmus of Panama with a railroad.

Amply illustrated with photographs by the author and adaptations of Catherwood's fine lithographs, considerably less delicate than the originals, "Maya Explorer" has again focussed attention on Stephens.

H. E. MOORE, JR.,
Gray Herbarium

Early South American Exploration

ESQUISSE DE MES VOYAGES AU BRESIL ET PARAGUAY. Auguste de Saint-Hillaire. 61 pages. Chronica Botanica, Waltham, Mass., 1946. $2. Stechert-Hafner, Inc., New York.

For five and a half years, from December 7, 1816, to May 5, 1822, Auguste de Saint-Hilaire collected and studied the plants of southeastern Brazil. Within this period he ranged from the northern part of the state of Minas Geraes at the 15th parallel to the Rio de la Plata at the 35th parallel south, covering some "2,500 French leagues" (approximately 7,500 miles), and amassing a plant collection of 7,600 numbers comprising "30,000 échantillons."

An account of these remarkable travels and achievements is given in the introduction of Saint-Hilaire's "Histoire des Plantes du Brésil et du Paraguay," the subject of the reprint in the original French in *Chronica Botanica,* Volume 10, No. 1. The introductory essay by Anna E. Jenkins, giving considerable biographical data and a chronological list of places visited by Saint-Hilaire, lays adequate background for the reading of the "Esquisse de mes Voyages au Brésil et Paraguay."

It is stimulating to have now so generally available a commentary and account of the work which has been one of the most important source materials for students of the flora of subtropical and temperate Brazil from the time of Martius' "Flora Brasiliensis" onward.

BASSETT MAGUIRE.

Fern Genera

GENERA FILICUM. Edwin Bingham Copeland. Annales Cryptogamici et Phytopathologici. Vol. 5. 247 pages, 10 plates. Chronica Botanica Co., Waltham, Mass.; Stechert-Hafner, Inc., New York, 1947. $6.

This, the outpouring of a lifetime's work on the ferns, comes as a fresh breeze in the dusty halls of systematic pteridology. For too many years taxonomists have been lumping the psilophytes, lycopods, and horsetails in a common group with the ferns under the general heading of "Ferns and Fern-allies." Actually, from a morphological standpoint, these so-called "fern-allies" are no more closely related to the main body of the ferns than they are to the seed plants; with no attempt at punning it can be said that the psilophytes, lycopods, and horsetails are each in a Class by themselves.

By the same token, morphologists have long known that the great and complex fern family Polypodiaceae, as usually defined, was polyphyletic—in other words, that it was "unnatural." In the present work Doctor Copeland has taken an excellent step in the direction of an evaluation of the evolutionary trends within the fern groups and of arriving at a systematic arrangement of the families along phyletic lines.

Three orders of the Filicineae—Ophioglossales, Marattiales and Filicales — are recognized. The greatest departure from the usual texts is the recognition of 19 families of Filicales. Keys to the families and genera are supplied. Although obviously not a book intended for the beginning student or amateur, a glossary of the highly specialized terms used in the keys and text would have been helpful. As an example one finds in the key, page 103, the following: "Venation Sagenioid or Pleocnemioid" *vs.* "Venation Goniopteroid or Meniscioid." A perhaps partially illustrated glossary would be welcome in such instances.

W. H. CAMP.

Aromatic Products From Plants and Animals

NATURAL PERFUME MATERIALS. Y. R. Naves and G. Mazuyer. Translated by E. Sagarin. 338 pages, illustrated. indexed. Reinhold, New York, 1947. $6.75.

The historical development of a conscious perfume industry, encompassing the cultivation of aromatic plants, the manufacture of odoriferous bases, and the forms in which these are applied, is charted in the recently translated work by Naves and Mazuyer. References are exhaustive and the illustrations are unusual.

An important section is the one devoted to the isolation of the odor principles from the natural products with emphasis on volatile solvent extraction. The tabulation of percentage yields of many flower oils obtained by different manufacturing procedures, accompanied by their evaluation from the standpoint of odor quality, represents valuable economic data. The virtues of various solvents and the industrial hazards involved are outlined. Much of this hitherto unpublished information has been common knowledge only to the producers in Grasse, in the southern part of France. Photographs and drawings of equipment are given.

The pages on composition and analysis are written with a realistic and commonsense approach to the problems of establishing identity, purity and fraud. As the title indicates, this volume is concerned with natural perfume materials; it has assembled in one place data on the majority of the rarer, finer and more unusual aromatic products of natural origin. The major portion of the book is a series of monographs on a carefully selected group of raw materials that are employed in high class perfumery. The flower oils, the resins, the herbs and the animal products are described as to odor-type, chemical constituents, and physical constants.

An outstanding feature is that the perfumers' as well as the chemists' viewpoint has been registered.

C. F. Wight,
Van Ameringen-Haebler, Inc.

Background for Beekeeping

AMERICAN HONEY PLANTS. Frank C. Pellett. 467 pages, illustrated, indexed. Orange Judd Co., New York, 1947. $6.

To encourage every beekeeper "to know fully the honey plants of his region" is the purpose of Mr. Pellett in his book "American Honey Plants." From the preface to the index he makes a wealth of information about nectar-bearing plants readily accessible, indicating which plants produce nectar in quality and quantity and explaining the effect of environment on their production.

Perhaps a little more stress on pollen production would be helpful, as brood needs pollen throughout the season. While the book is primarily for the commercial beekeeper, Mr. Pellett seems at times a little fearful of enthusiasm—hesitating to encourage anyone to go "all out" for a million by producing honey.

"American Honey Plants" can be helpful and enjoyable to the gardener, the horticulturist, and the fruit grower as well as the beekeeper, and quite as much to the layman. Any inquiring mind can read with delight of the whys and wherefores of the varieties of honey, and by reading dispose of that bugaboo "standard product" on the grocery shelves—such honey as weather and nature have never produced.

"American Honey Plants" should be on the "must" list of every public library where a book of such price can be readily available to those who glean thirty cents here and there from a pound of honey. The illustrations are not only clear photographs but a delight to look at for their compositions as pictures. Mr. Pellett has given generously of his knowledge and experience, and we keepers of bees are grateful to him for such concise information.

Mary Louise Coleman.

Leaf Rust of Wheat

THE NATURE AND PREVENTION OF THE CEREAL RUSTS as exemplified in the leaf rust of wheat. K. Starr Chester. 269 pages, illustrated, indexed. Chronica Botanica Co., Waltham, Mass. Stechert-Hafner, Inc., New York. 1947. $5.

This is a presentation of the nature, importance, control, and other aspects of the leaf rust of wheat; it is a comprehensive treatment of this rust but is not a monographic treatment of the cereal rusts, as the cover title ("The Cereal Rusts") might indicate.

Pathologists and mycologists will find much of interest and consequence in this splendid account of the leaf rust. So much has been written about the black stem rust that its economic significance has come to be generally recognized. Leaf rust is far more destructive than is generally appreciated by either scientists or laymen. This book will go far in building up adequate concepts of leaf rust and, in the words of the author, reveal its true proportions among the major destroyers of the world's food grain.

The topics of nomenclature, morphology, cytology, and sexuality are fully considered. The discussion of the role of the alternate hosts (fam. Ranunculaceae) in nature leads to the conclusion that, "In most areas of the world there is rather convincing evidence that the alternate host is dispensed with, and that the fungus is perpetuated in the uredinial stage." The subject of the origin of new physiologic races through the mating of two races on the alternate host is discussed, but so far as this rust is concerned it is concluded that, "New races have other origins (as by mutation) than the sexual phase of the fungus." It is good to have the evidence so well reviewed.

The factors affecting rust survival, development, and dissemination are clearly presented. Control of this important disease includes a thorough discussion of natural, regulatory, and cultural measures, use of fungicides, and host resistance. The author believes that there are possibilities for control not yet attained through sulphur dusting, but thinks the development of varietal resistance in wheat offers the most economical means and offers the most promising results There have been achievements in breeding for rust resistance but it is well said that, "We are still far from our goal of universal rust control by this means, and much work lies ahead."

FRANK D. KERN,
The Pennsylvania State College.

Introductory Text

PLANT BIOLOGY. Paul Weatherwax. 451 pages, illustrations, glossary, index. W. B. Saunders, New York, Second edition, 1947. $4.25.

This excellent little book is intended primarily for colleges and universities where there is not enough time in the curriculum for the traditional botany courses. In it Professor Weatherwax has made a special effort to present only the bare essentials of botanical science, leaving the details of the various branches of botany for more advanced courses to be taken only by students intending to specialize in this or a related field.

The first 16 chapters emphasize broad biologic principles as exemplified in plants—cells, protoplasm, sources and use of food, nature and work of leaves, relation of roots and soil, transportation and storage of food, growth, responses to stimuli, reproduction, etc. These are followed by chapters on heredity, evolution, ecologic relations, brief descriptions of the principal groups of plants, and a very usable glossary. The illustrations, of which there are 380 on 190 figures, are uniformly excellent; one could wish for more of them.

H. N. MOLDENKE.

Shrubs and Trees in All Seasons

KEYS TO WOODY PLANTS. W. C. Muenscher. 108 pages, bibliography, index. Comstock Publishing Co., Ithaca, N. Y., 1946. $1.25.

This useful little book is now in a fifth edition and with a cloth binding. Of particular note are the summer and winter keys, the listing as to whether native or cultivated, and the bibliography of the more up-to-date books on woody plants.

Tropical Horticulture

SHADE AND ORNAMENTAL TREES FOR SOUTHERN FLORIDA AND CUBA. David Sturrock & Edwin A. Menninger. 172 pages, illustrated, indexed. Stuart Daily News, Inc., Stuart, Fla., 1946. In cloth, $3.50; paper, $2.50.

A worthwhile book for those interested in tropical horticulture. It consists of a listing with descriptions of the lesser-known tropical trees recommended for southern Florida and Cuba, preceded by a discussion as to the purposes for which they may be used.

Notes, News, and Comment

A.A.A.S. During the meetings of the American Association for the Advancement of Science in Chicago Dec. 26—31, Dr. H. A. Gleason was elected President of the Botanical Society of America for 1948. Dr. W. H. Camp was chosen Secretary-Treasurer of the American Society of Plant Taxonomists and was named on the Council of the Society. Dr. Camp was also elected to the Council of the Society for the Study of Evolution and was made an associate editor of the organization's year-old periodical, *Evolution.*

Dr. William J. Robbins presided at the Saturday symposium on nutrition and metabolism of microorganisms, arranged by the Microbiological section of the Botanical Society of America, and with Dr. Ilda McVeigh gave a paper at the same meeting on "Relation of *Rhodotorula aurantiaca* to Pteroglutamic Acid and Some Related Compounds." He also presided at the Tuesday session of the Microbiological section, and at a symposium on antibiotics in a program of the section on Medical Sciences he spoke on "Basidiomycetes as Sources of Antibiotic Substances." At a joint meeting of the various plant societies associated with the section on Botanical Sciences, Saturday afternoon, Dec. 27, he spoke on "Nutrient Requirements of Fungi."

With Richard H. Goodwin, Dr. Frederick W. Kavanagh gave a paper on "Fluorescing Substance in Roots" at a joint session of the Botanical Society of America with the American Society of Plant Physiologists.

Dr. R. A. Howard presented "A Note on Eric Leonard Ekman" at a joint meeting of the Systematic section of the Botanical Society of America with the American Society of Plant Taxonomists.

Dr. Donald P. Rogers spoke on "Elias Fries on Fungus Taxonomy" before the Mycological Society of America.

Dr. Rogers and Dr. Howard represented the Garden at a conference of herbarium curators, which took place at the Chicago Museum of Natural History during the meetings.

At a symposium on botanical nomenclature presented during a joint session of the Systematic section and the American Society of Plant Taxonomists Dr. H. W. Rickett's subject was "As a Botanical Editor Studies the International Rules." At another meeting of the same two groups, Dr. Camp appeared on the program with the title "A Taxonomist Takes to the Woods."

Speakers from the Garden's staff and others who attended the meetings, including Dr. Robert S. de Ropp and Dr. Annette Hervey, reviewed their impressions of the meetings at the monthly conference of staff and students at the Garden Jan. 9.

President. Dr. Edmund W. Sinnott of Yale University, a member of the Garden's Board of Managers, was elected President of the American Association for the Advancement of Science for 1948. He has in the past been President of the Botanical Society of America, the American Society of Naturalists, and the Torrey Botanical Club, as well as Editor-in-Chief of the *American Journal of Botany* for six years. He is a member of the National Academy of Sciences, American Philosophical Society, and the American Academy of Arts and Sciences, and the author of two important botanical texts: "Principles of Genetics" and "Botany: Principles and Problems." Through his recent studies of cucurbits, in 1943, with Robert Bloch, he contributed a leading article to the Journal of the New York Botanical Garden on the uses of the luffa gourd.

Torrey Club. Two members of the Garden's staff are among the new officers of the Torrey Botanical Club. Dr. W. H. Camp was elected Second Vice-President and Dr. Donald P. Rogers Recording Secretary at the annual meeting Jan. 8. The President for 1948 is Dr. John A. Small; First Vice-President, Dr. G. S. Avery, Jr.; Corresponding Secretary, Dr. Jennie Simpson; Treasurer, Dr. Elva Lawton. Dr. F. W. Kavanagh is among the members of the Council of the Club. Dr. F. J. Seaver continues as representative of the Torrey Club on the Botanical Garden's Board of Managers; Dr. H. W. Rickett remains as Editor, and Mrs. Lazella Schwarten as Bibliographer.

Eloise Luquer. A brief illness caused the death on Dec. 28 of Eloise Payne Luquer of Bedford Hills, N. Y., at the age of 85. Miss Luquer had spent many years painting the wild flowers of Westchester County, and she had a remarkable collection of watercolors, noteworthy

alike for their artistry and accuracy. Many of these were exhibited at the Garden for the Members' Day program of June 5, 1946, at which Miss Luquer spoke. Miss Luquer is survived by a brother, Thatcher T. P. Luquer, who has long been a member of the Garden.

Mrs. H. E. Manville. The death of Mrs. H. Edward Manville of Pleasantville, N. Y., occurred in October. Mrs. Manville had been active for many years in gardening activities in Westchester County. She was elected to the Corporation of the New York Botanical Garden Jan. 8, 1934.

Letter of Appreciation. With the relinquishing of the reins of *Mycologia,* after 23 years of editorship, Dr. F. J. Seaver has received a note of commendation from the American Mycological Society. After expressing "the deep appreciation of the Society for your splendid management of *Mycologia* throughout the years," Dr. Julian H. Miller, writing as newly elected President of the Society, says further: "We feel that no other contemporary journal has consistently maintained as high a standard of accuracy and quality. Then you are to be especially commended for the present financial status of *Mycologia.*"

Guatemala. B. A. Krukoff returned Dec. 6 from a two months' trip to Guatemala and Costa Rica, where he was inspecting the cinchona plantations of Merck & Co. One of these plantations, "El Naranjo," at Chicacao, Guatemala, has been in charge of Ralph Pinkus, former Arboretum Foreman at the New York Botanical Garden, since the end of 1942.

Lectures. At the Eastern Nurserymen's Convention at the Hotel Pennsylvania in New York Jan. 6, Dr. W. H. Camp spoke on the subject "A Taxonomist Looks at Horticulture" and Dr. E. E. Naylor showed the Garden's long film of "Scenes and Activities." In Boston Jan. 22, Dr. Camp addressed the New England Nurserymen's Association on "Chromosomes in Horticulture." Before the group studying Fundamentals of Systematics at the Philadelphia Academy of Sciences Jan. 10, Dr. Camp discussed the structure of plant populations. He also spoke before the Millbrook Garden Club, an Affiliate, in New York Jan. 15 on "Origins of Common Garden Plants."

Dr. E. E. Naylor spoke on the Garden's activities at a meeting of the Elizabeth Garden Club, an Affiliate, Jan. 7.

Dr. H. W. Rickett addressed another Affiliate, the New Canaan Garden Club, in New York Jan. 21 on "Gardens of Antiquity."

The Masonic Lodge of White Plains heard Dr. F. J. Seaver in a lecture on Bermuda Dec. 5.

Dr. P. P. Pirone addressed the annual meeting of the New Jersey Shade Tree Commissions at Newark Dec. 4 on "Conditioning Trees Subjected to Environmental Changes." He also conducted a disease clinic at the meeting.

Writers. The January number of *House and Garden* magazine features an article by Dr. P. P. Pirone on how to provide the conditions that give plants resistance to disease and pests. *Science Illustrated* for December contains an article by T. H. Everett telling how vegetable greens and herbs may be raised indoors over winter.

Visitors. Dr. F. R. Fosberg, who has just returned from nearly a year of plant collecting in South America, visited the Garden Jan. 5, on his way to Honolulu, where he will teach during the spring term at the University of Hawaii. On a grant from the John Simon Guggenheim Memorial Foundation, Dr. Fosberg went to South America to continue the studies of *Cinchona* which he had undertaken while there during the war. Aided also by funds from the New York Botanical Garden, he did general plant collecting, and is depositing at the Garden a set of approximately 3,000 numbers from half a dozen countries.

Also enroute to Hawaii to spend the spring months, Dr. Carl Skottsberg of the Botanical Garden at Göteborg, Sweden, stopped at the Garden the following week.

Among other visitors since the first of the year have been Manual J. de Urries of the Botanical Garden at Madrid; Efraim Hernandez X., of the Office of Special Studies in Mexico City, accompanied by Faustino Miranda of the Biological Institute there; Wilson Hoehne of São Paulo, Brazil; Selma Kojan, former Technical Assistant, now at the University of Cincinnati; and Franklin C. Moore of Minneapolis, a former student gardener.

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue surface car to Bedford Park Boulevard

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs. Elon Huntington Hooker, First Vice-Chairman; Mrs. Richard de Wolfe Brixey, Second Vice-Chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Guthrie Shaw, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

VOL. 49
No. 579

MARCH
1948

PAGES
49–76

EARLY SPRING EVENTS AT THE GARDEN

Members' Day Programs

3 p.m. in the Members' Room

March 3 *Recent Horticultural Collecting in Puerto Rico* — *E. J. Alexander*, Associate Curator

April 7 *Arrow-Poison Plants of the South American Indians* — *Harold N. Moldenke*, Associate Curator

Free Saturday Programs

3 p.m. in the Lecture Hall

March 6 *Food for New York's Birds* — *Lorine Letcher Butler*

March 13 *"How Does Your Garden Grow?"*
A motion picture in color —Narrated by Lowell Thomas

March 20 *Starting a Children's Garden* — *Romaine F. Button*, School Gardens Association

March 27 *Small Garden Problems* — *Ruth N. Wetzel*

April 3 *Scenes and Activities at the Botanical Garden*
A motion picture in natural color

April 10 *New Plants from Mexico's Mountains* — *E. J. Alexander*

Educational Program

Botany for Beginners

Six sessions, Mondays, 3—4 p.m., April 12—May 17
Instructor—*E. E. Naylor* $5

Field Botany

Seven sessions, Saturdays, 1:30—3 p.m. Alertness credit for teachers
Instructor *G. L. Wittrock* $5
($2.50 to teachers; single trip $1)

Outdoor Gardening Practice

Eight sessions, Thursdays, 7—8:45 p.m. Open only to those who have successfully completed the term in Outdoor Flower Gardening. April 22—June 10
Instructors—*George H. Gillies and Arthur King* $15

Garden Contruction

Eight sessions, Tuesdays, 7—8:45 p.m. April 27—June 15
Instructor—*A. C. Pfander* $10

Radio Programs

"Calling All Gardeners" every Saturday morning from 8:30 to 8:45 over WNYC.

Museum Exhibits

Ornamental Algae to be continued, followed about April 20 by watercolors of plants of the tropics by Mrs. Charles Platt of Philadelphia.

Conservatory Displays

A continuous exhibit of indoor flowering plants of springtime, in addition to the permanent exhibits of important groups of plants

TABLE OF CONTENTS

MARCH 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription $1.50. Single copies 15 cents.

JOURNAL

of

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VOL. 49 | MARCH 1948 | NO. 579

The Elms of America . . .

What Is To Be Their Fate?

A Deadly Virus Stalks The Trees That Have Escaped The Dutch Elm Disease

* * *

A Survey of the Present Situation and the Outlook for the Future, In the Light of Experience and Research, With Recommendations for Every Property Owner Who Wants the Elm Trees Saved

By Carol H. Woodward

JUST as hope begins to dawn for more effective means of holding the Dutch elm disease in check and thereby saving one of the finest features of the American landscape, a new disease strikes this country's favorite shade tree and threatens it with even more rapid extermination than the fungus disease did, when, fifteen years ago, it was first recognized as a serious pest. At present, although positive measures of control are not yet established, there is reason to believe that with continued research and concentrated effort toward protection of our trees, the elm-destroying fungus, *Ceratostomella Ulmi*,* can be held within reasonable bounds.

But the new disease, called PHLOEM NECROSIS, is caused by a virus which takes quick toll of an infected tree. It has leaped into five new middle western states in a four-year period, traveling chiefly along river valleys,

* The specific name of the fungus is capitalized throughout this article in accordance with the International Rules, even though the plant pathologists have adopted the custom of decapitalization.

and has alarmed easterners with its sudden appearance in Chattanooga, Tenn., across an area of sparse elm growth which it had been hoped would serve as a barrier. It now occurs in more than a dozen states.

Vector of Phloem Necrosis Discovered

Until 1947, no one knew what agent caused the spread of the disease. Last summer, for the first time, actual transmission of elm phloem necrosis was accomplished with the elm leaf hopper *Scaphoideus luteolus.* The experiments were carried out at the United States Department of Agriculture's Bureau of Entomology and Plant Quarantine at Columbus, Ohio, where Dr. R. R. Whitten is Senior Entomologist in charge. A paper by W. L. Baker on the leaf hopper as the probable transmitting agent, or vector, is to be published this spring, probably in *Science.*

First reported in Ohio in 1918, phloem necrosis is now believed to have been the cause of many elms dying in Illinois in 1882 and in Kentucky in the 1890s. It was not identified as a disease of virus origin, however, until 1938, when it began to reach epidemic proportions. It now extends from southeastern Nebraska, Kansas, and Oklahoma eastward to West Virginia, Kentucky, and Tennessee, and it has gone south as far as Jackson, Miss. It is also believed to be in northern Alabama. So far, no infected tree has survived. Death is sudden, often in less than a year, and without warning beyond the yellowing of the leaves. No preventive treatment has yet been found effective; not even healthy, vigorous elms are

HOW TO RECOGNIZE ELM PHLOEM NECROSIS

I. Foliage Symptoms

On small trees particularly, leaves of the entire crown may turn yellow and eventually fall, or they may become dry and brown and remain on the tree even after it is dead.

On large trees, the leaves, which are apt to be sparse at the tips of the branches, droop and the edges curl inward, producing a trough-like effect. The leaves become gradually yellow, then brown, and the tree soon dies.

II. Wood Symptoms

The large roots, trunk, and some branches of an afflicted tree exhibit discoloration in the inner bark or phloem tissue. This is at first yellow, then light brown flecked with brown or black, and later very dark brown. If a piece of the discolored wood is held tightly in the hand for a few minutes or closed within a vial, a wintergreen odor will become evident upon its exposure.

Other diseases produce similar foliage symptoms and even staining of the wood. It is the combination of *discoloration of the phloem* with *wintergreen odor* that characterizes elm phloem necrosis.

immune to the virus, which affects the phloem, the soft conductive tissue just outside the cambium layer. It is through the phloem that nutrients are conveyed from the leaves down through the branches and trunk.

Until this year, the principal hope has seemed to lie in finding elms that are resistant to the disease. Now that the leaf hopper is believed to be the vector, a second course of action may be the waging of a fight against this culprit.

The Dutch elm disease attacks every native species of elm in America, and most of those that are cultivated, except for the small Chinese and Siberian elms, *Ulmus parviflora* and *U. pumila.* Phloem necrosis, on the other hand, seems to confine itself to the choicest ones of all, the vase-shaped *Ulmus americana,* its columnar variety, the Moline elm, and also the winged elm, *U. alata,* an important species in the South.

The fact that the first official reports of both phloem necrosis and the Dutch elm disease have come from Ohio should be considered a credit to the alertness of the foresters and plant pathologists there, rather than a reflection on the condition of trees in that state.

The Dutch Elm Disease in Retrospect

It was in 1930 that the Dutch elm disease was first discovered on four dead elms in Ohio, but it was not until three years later that the source of the disease was found to be infected logs which were being imported from Europe to New York, Baltimore, Norfolk, and New Orleans for use as furniture veneer. The disease had ravaged street plantings, parks and estates for a number of years in European countries.

The Dutch elm disease has taken its heaviest toll in the northeastern states. It is not found in western New York or western Pennsylvania, but the bark beetle which carries it from tree to tree is there, and the fungus is likely to follow wherever the beetle makes a new invasion of territory. Recently a heavy infection has occurred in eastern Canada. Only five years ago the area afflicted with the Dutch elm disease was 18,000 square miles. Today (as of May 1947) it is 48,085 square miles, extending from New England to the Middle West. The territory has more than doubled since 1944.[1]

---

[1] In Connecticut, the area known to be infected with *Ceratostomella Ulmi* has jumped from 2,662 square miles to 4,227 in the past three years. From 369 square miles in 1944, Indiana increased to 413 the following year, then, with a heavy infestation in 1947, found 1,230 square miles infected by the middle of the year. Territory affected in Maryland has increased from 348 in 1944 to 962 square miles in 1947. Massachusetts, where 250 square miles were infected in 1944, now has 1,517 of the state's 8,000 square miles of land troubled with Dutch elm disease. The 567 cases newly discovered in 1947 more than doubled the total of the preceding seven years. New Jersey, where the heaviest infestation was reported early, has not—or could not—feel much increase later. Figures for 1947 were 4,477 square miles of land out of the state's 7,514. New York, six times as large, had 14,210 square miles infected in 1947. In Ohio, where the trouble was first reported, the disease has spread over 12,495 square miles.

Conservative, unofficial estimates place the number of trees that have been killed by *Ceratostomella Ulmi* in the past fifteen years at 150,000. Some observers give a much higher figure.

Beetles Which Carry the Disease

Were it not for a tiny beetle which had established itself in this country nearly half a century before the fungus was known to have arrived, the Dutch elm disease would not be a matter of great concern. But this small European bark beetle, *Scolytus multistriatus*, is the principal carrier of the Dutch elm disease. There is also a native American bark beetle, *Hylurgopinus rufipes,* which also penetrates trunks and branches of elms, but it is not so often responsible for transporting the fungus. In Canada, where the European beetle is not yet present, it does its most devastating work.[2]

The bark beetles carry the fungus on or in their bodies. It does them no harm; it merely clings to them like so much rather sticky dust. It will be on the female's body when she bores through the bark of an elm, and it will grow in the perpendicular tunnel she digs to receive her eggs. It will extend its threads and spores into the wavy transverse tunnels made between the wood and bark by her hungry brood after the grubs have hatched. When in the spring these grubs, transformed into beetles, bore their way out through the bark, they carry the fungus with them.

The first goal of the *Scolytus* beetles is a feeding place, and this they readily find on the nearest elm, where they nibble, sometimes at the buds, but generally into the soft wood in the crotches of twigs. It is at this point that the fungus, borne on the young beetle's body, enters the tree, and from the tiny wound made by the beetle, it spreads rapidly through the tree's water-conducting system.

The spore clusters (called COREMIA) which the fungus sends out in its process of growth, choke the water passages. In addition, the wounding of the cells by the presence of the fungus results in the formation of tyloses, or gums, which further plug the vessels.

At the same time, toxins, or poisons, are given off by the fungus, one of which causes the leaves to turn yellow, then brown; the other, it is believed, causes the wilting which is another symptom of the presence of *Ceratostomella Ulmi.* These and other factors eventually—generally within a year or two—kill the entire tree.

In eastern New York, the beetles customarily emerge from their winter quarters underneath the bark during May; around Boston, May 27. (There is also a large late summer brood, but this is of less consequence

---

[2] Some observers strongly suspect that there is still an unknown carrier, for occasional elms have been killed by *Ceratostomella* without a sign of beetles or of beetle injury being found on the trees.

in conveying the disease.) This date in each section is important in any program for control. In 1945, the New York beetles, encouraged by the warm weather of an abnormally early spring, stole a march and came out in April. Workers who had planned to complete their control mea-

When the Dutch elm disease strikes a tree, one effect is defoliation early in the season.

sures against the beetles by May 1 were caught unawares, and the insects had an extra month in which to infect healthy elms when they were most susceptible. The next year there was an exceptionally large toll taken among elms because of the fungus carried by the beetles. New York State's instructions now are to have all the spring preventive work finished in March. The record of the past year in New York State gives evidence that sanitation there has paid.

Danger of Weakened Trees

At breeding time, the bark beetles have a special fondness for trees that have been weakened by one cause or another, such as lack of needed nutrients or attacks by insect pests and plant diseases, including the Dutch elm disease itself. A tree that has been freshly cut or a pile of elm lumber with the bark in place also makes a nice comfortable home for an elm bark beetle family. The wood of an ailing tree or of recently felled trees has just the right amount of moisture and is less resistant to the mandibles of the female beetle when she starts to bore through the bark in her search for a nesting site. A vigorous, healthy tree will be shunned by a beetle seeking the proper environment for her eggs. If she finds no suitable elm within her flying range (which at feeding time would be about 1,000 feet)[3] she may be forced to abandon her egg-laying for the season. It has therefore been hoped that removal of potential breeding wood might reduce the number of elm bark beetles.

In the late 1930's a process known as silviciding was adopted to poison weakened trees in which bark beetles otherwise might breed. The trunk was girdled and a chemical which would kill the tree was applied to the

[3] During the breeding season the beetles may fly three miles or be blown much greater distances.

These two beetles (shown here about 15 times natural size) carry the Dutch elm fungus to healthy trees. The European elm bark beetle, at the left, is the principal vector of the disease. The American species, at the right, carries the fungus in Canada and to a minor extent in other regions.

wound. Tens of thousands of specimens were thus eliminated, but the disease has continued to spread despite efforts in this and many other directions to curb it.[4] On the average, the number of new outbreaks in a year has slackened only slightly—largely because of preventive work, which has been called a case of "too little and too late."

How Control is Being Attempted

What is being done today to prevent the spread of the fungus and of the beetle which carries it?

During the first agitated years after the discovery of the disease, Federal funds were granted in generous amounts. Scouts were provided, identification centers were maintained, research was carried on, and quarantines were effected. Each state concerned co-operated in these efforts, sometimes through the Agricultural Experiment Station or the State Department of Agriculture or Forestry, sometimes through the colleges, often with local tree authorities, park departments, and even garden clubs assisting.

Gradually, Federal support for the work subsided, as relief moneys dwindled, until last year the states found themselves carrying most of the burden alone, with only the help of local authorities and private property owners. All control work was stopped by the United States Department of Agriculture in 1941. The quarantine was revoked in May 1947 on the ground that it had been ineffective in preventing spread of the disease. The principal work of the Federal Government now is to maintain research groups in New Jersey and Ohio and an identification laboratory at East Orange, New Jersey. *To this place, anyone in the United States who has a tree which he suspects of being afflicted with Dutch elm disease, may—and should—send samples of twigs and wood, to have the malady diagnosed and a course of action recommended.*

State or local park, forest, and shade tree authorities now do what their limited funds permit toward the spotting and eliminating of diseased trees and dangerous points of infection, but when an afflicted tree or a pile of beetle-infested wood is on private property, all they can do is to point out the risk to the property owner and trust that he has the interest of his own and his neighbors' trees sufficiently at heart to take remedial measures. If the scouts find dead or dying trees or piles of elm wood with the bark in place, measures should be taken at once to eliminate these sources of infection. So far, there is little hope of rescuing a diseased tree. The object is to protect the surrounding trees that are still healthy.

Property owners, on the whole, have been co-operative. According to

---

[4] It has been maintained that silviciding actually defeated its own purpose by only partially killing the weakened elms and thus continuing to provide breeding places for the beetles.

SYMPTOMS OF THE DUTCH ELM DISEASE

Without obtaining a laboratory culture of the causal fungus, Ceratostomella Ulmi, it is impossible to ascertain whether or not a sickly tree is afflicted with the Dutch elm disease. A tree is under suspicion, however, when it exhibits the following combination of symptoms:

1. Many dead branches on the tree.

2. Leaves which wilt and turn dull green *or* become yellow, then brown, and fall from the branches prematurely.

   But: Elm leaf beetles, drought, malnutrition, and other factors, including elm phloem necrosis, may cause similar symptoms. The work of leaf-feeders can be distinguished by the holes they eat in the leaves. These are *not* evidence of Dutch elm disease.

3. Weak growth of new branches, undersized leaves, and an abundance of suckers on the trunk, with a tendency of small branches to curve inward instead of arching outward.

4. Brownish discoloration in the outer rings of the sapwood, noticeable as an oval ring when a live twig is cut obliquely at one end. The discoloration may also appear as streaks or flecks in the sapwood when a twig is cut longitudinally; or it may be evident as broken streaks in the wood directly beneath the bark.

   But: Other fungus diseases of elm may produce similar discolorations. *Also note:* (1) *Ceratostomella* may be present in dead wood without showing the usual brownish stains. (2) Rotten wood and crumbly bark are *not* evidence of Dutch elm disease. It occurs only in living and recently dead wood.

5. Shot-hole openings in the bark, made by elm bark beetles.

   Note: Woodpeckers drilling for insects in an elm, especially before the leaves appear, should serve as a warning of the presence of beetles.

6. Tunnels made by beetle larvae in a wavy double-comb pattern in the wood directly beneath the bark.

* * *

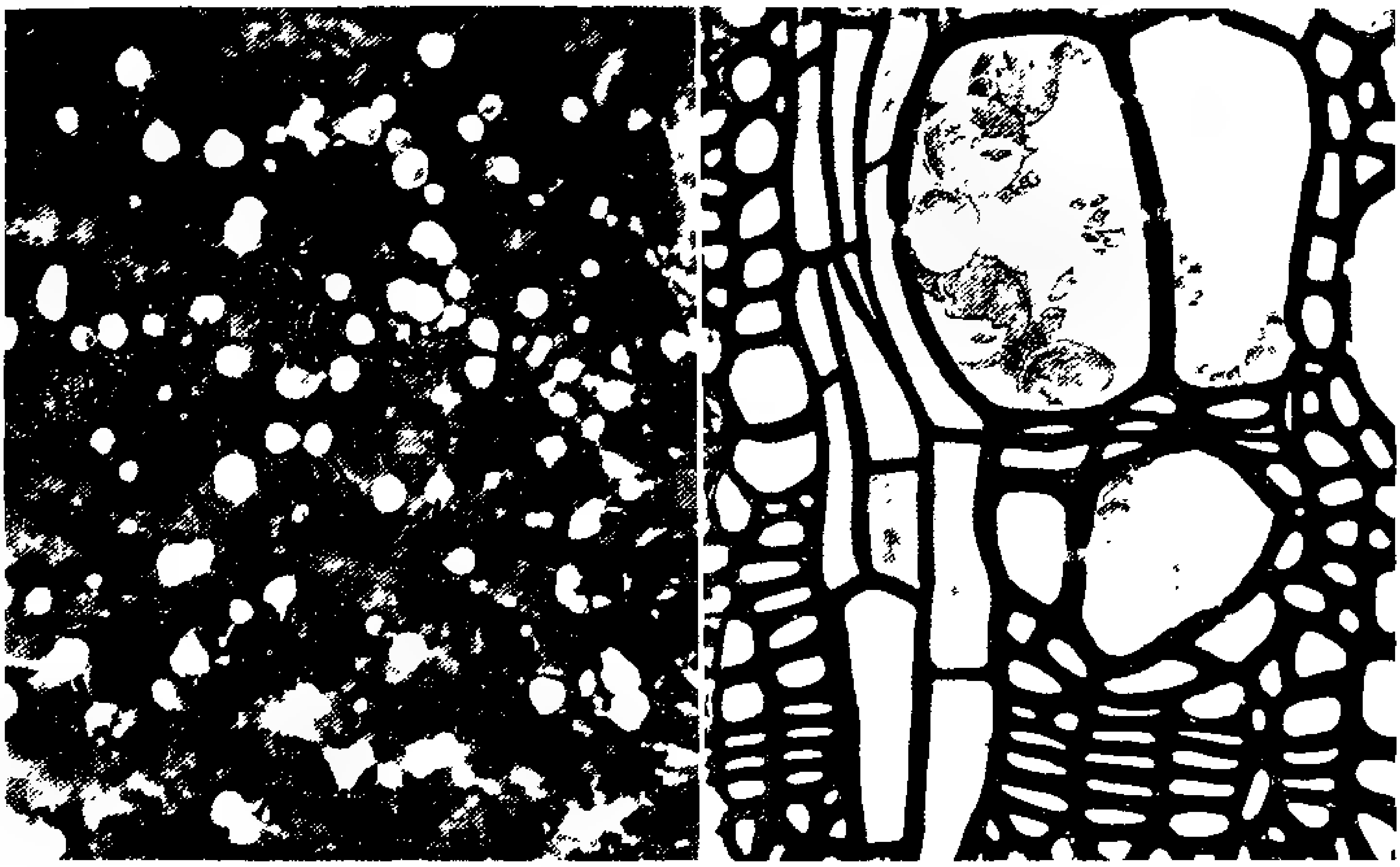
While evidence of beetles does not prove the presence of Dutch elm disease, it is a sign that the fungus may be there, for the beetles customarily carry it on their bodies.

The fungus itself is too small to be seen with the naked eye. It must therefore be cultured in a laboratory.

For information on how to get this done, if you have a suspicious-looking tree, see page 62.

Dr. W. H. Rankin of White Plains, who has charge of Dutch elm disease control work in New York State:

"In most places public officials and property owners actively attacked the problem and followed carefully the control plans prepared by our field forces. Instead of increased losses in 1947 if no control had been used, the diseased tree rate was cut in



Water-conducting vessels of a tree are clogged by two forces when Dutch elm disease strikes. At the left are shown the microscopic coremia, or clusters of spores, which grow into the narrow passages. At the right are shown the gums, or tyloses, which further obstruct the tissues. These are wound responses of the tree, which develop as a result of the injury caused by the presence of the fungus.

1947 to about 40% of the 1946 rate on the average. The figure for Albany, as an example, is 73 diseased elms in 1947 compared with 194 in 1946. Most of these cases in 1947 were carry-over 1945 infections that did not wilt until 1947 and could not be prevented. Further reductions are expected for next year, due to the continuing active interest of most communities to meet the situation."

In Connecticut, one of the most seriously afflicted states, where there is an estimated total of nearly 10,000 undiagnosed cases, in addition to 4,100 known cases of Dutch elm disease at present, the responsibility for elm tree care rests entirely with each town, except that on state property diseased trees are removed by state agencies.

While in most of the states the towns are generally able to take care of the removal of dead elms, the war years, with their manpower shortage, gave the Dutch elm disease such headway everywhere that by now there are far too many dead elm trees standing. Every one of these is a hazard. Moreover, the physical problem even under the best of conditions, for removing diseased trees between the time infection is noted and the time when the next generation of beetles emerges, is so great as to be almost insurmountable. Further, when trees are removed, it is admitted that all too often they are simply hauled to the city dump and left without the bark being removed or treated, with the result that the beetles emerge and carry the fungus to new trees just as effectively as though the trees had been left standing.

All cut elm wood with bark, whether already infested or not, should be thoroughly wet with a 1% solution of DDT in No. 2 fuel oil. This mixture should not, however, be applied to living trees.

If the bark is removed from a tree, the exposure will kill the larvae that are slowly feeding and growing in their tunnels directly beneath.[5] But if they are allowed to remain protected until they are mature, as beetles they will bore their way out and promptly fly to a healthy tree where they will implant the sticky fungus spores they are bearing on their bodies.

Hope for the Future Through Experimental Research

Authorities at the Connecticut Agricultural Experiment Station in New Haven are convinced that the future of our elm trees, so far as the Dutch elm disease is concerned, lies in experiments to protect living trees from infection and to prolong the life and reduce the virulence of the disease in infected trees. Four years of concentrated research have already gone into these problems, particularly in attempts to combat the fungus in the tree itself through the application of a new procedure known as CHEMOTHERAPY, which is briefly described on a later page.

New Jersey and Ohio, co-operating with Federal authorities, are trying to discourage the elm bark beetles by blowing a high-powered mist of DDT into their trees. The beetles, they maintain, will not feed in a tree that has been thoroughly sprayed, and in time they will die from contact with the poison on the tree. These, like the Connecticut experiments, are still in an embryonic stage, but they are promising.

The town of Englewood, N. J., was used in 1947 as an experimental plot. Approximately 2,300 trees were sprayed with various combinations and concentrations of DDT to ascertain the benefits that could be derived in the control of bark beetle feeding. While a maximum dosage of one-quarter pound of DDT to an average-sized tree (one of 50 inches circumference 4 feet above the ground), was found insufficient to curb the beetles, the experiments will be continued in 1948 in the hope of arriving at a formula that can be recommended with assurance to highway commissions, park departments, and individual owners of elm trees. Meanwhile, as an expedient, to prevent feeding by the beetles which carry the Dutch elm disease, the United States Department of Agriculture suggests 2% DDT emulsion applied so as to completely cover the bark surface of an elm tree before foliage appears, followed by a similar treatment with a 1% emulsion three months later.

---

[5] Beetles occasionally will complete their development in the bark alone.

These DDT emulsions have been found to produce residues highly toxic to elm leaf-eating insects, making their use a factor in maintaining the trees' vigor.

General Health of Trees an Important Factor

Authorities in all states concerned agree that to maintain elms in vigorous condition is of prime importance in cutting down ravages from the Dutch elm disease. Among the factors tending to weaken elms and make them a more ready prey to bark beetles at breeding time are leaf-eating insects, also leaf-spot diseases, poor soil with lack of needed fertilizers, insufficient moisture, presence of illuminating gas in the soil, smoky atmosphere, root injury from grading and building operations, and failure to prune off dead wood from otherwise healthy trees.

Indolent people who do not care enough about their own trees to give them proper attention are among the most reprehensible enemies of the elm population. Edgar G. Rex, writing from Trenton, N. J., says:

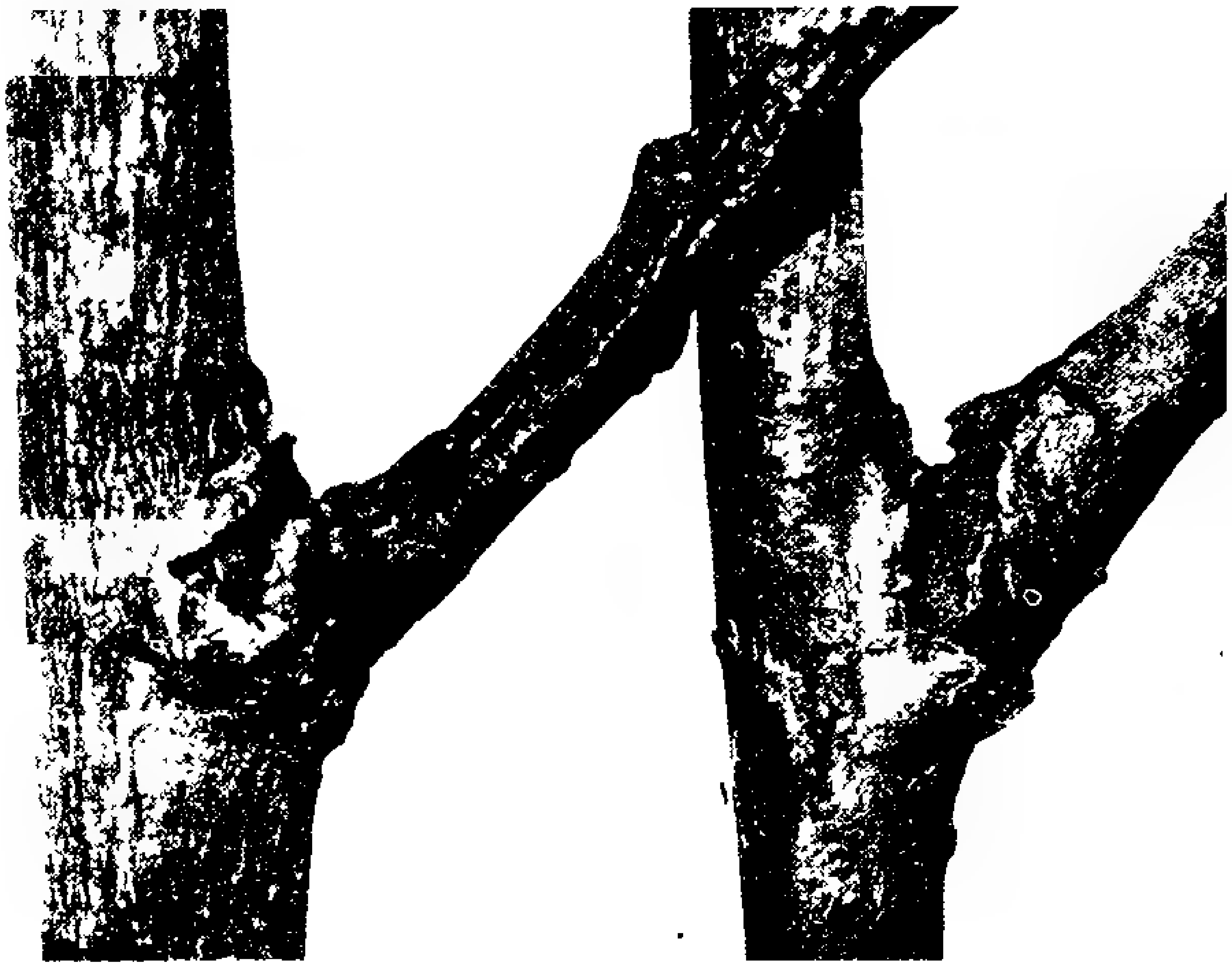
"This department has continually maintained that unless the owner of a tree is sufficiently interested in the protection of its foliage against defoliators, there is no excuse for becoming unduly alarmed about the advance of the Dutch elm disease."

The New Jersey Department of Agriculture's Bureau of Plant Industry, of which he is Plant Pathologist, has kept the people well informed as to the need of protecting their elm trees from the weakening effects of pests and diseases and bad care, and has issued mimeographed instructions for handling a tree that is suspected of being a victim of Dutch elm disease.

A practical hope is expressed by New Jersey authorities that a good commercial use can be found for the elm wood that has been cut as a measure of protection for other trees. The prospect of making a profit from such wood would speed the removal of the many dead and dying elms which remain standing because it costs so much to remove them. Estimates on the cost of cutting, trimming, and hauling elms to the dump range in different states and under varying circumstances from $5 for a small tree in an open woodlot to $150 or even several hundred dollars for a large tree where wires, buildings, or other plants must be protected

"No prospect of the alleviation of the financial strain of the removal of dead and dying elm trees is in sight," writes Mr. Rex. "If the involved wood could be directed into commercial channels, the end product of which could be offered for sale, such returns would be of considerable help. However, the warping and checking characteristic of elm wood mitigate against its use in the lumber field, and at the present time researches in the production of charcoal have not progressed to the point of commercial application."

Elm logs are now used to some extent for cooperage and furniture, boxes, crossties, and farm purposes, as well as for veneer. If more extensive commercial use could be found for the elm wood, the problem of having the cut trees dragged to the town dump, from where the beetles



The crotches of twigs, when the wood is tender and moist in spring, are the favorite feeding grounds of elm bark beetles. If they are carrying the Dutch elm disease fungus on their bodies, spores will enter the tree through the wounds they make. From these spores, the fungus will rapidly grow and soon invade the water-conducting system, bringing doom to the tree.

have continued their destructive work, could be surmounted and the trees which are carriers of the disease might gradually be eliminated from the landscape.

Activities in the Northeastern States

Although only two New England states have been severely afflicted with the Dutch elm disease – Connecticut and Massachusetts—the New England Council, which estimates that the six states contain about 50,000,000 elms, of which about one-tenth are on or adjacent to highways and streets, has been enough concerned to call meetings at its headquarters in Boston to discuss joint action for the control of the disease.

Maine has not yet been invaded by the fungus-carrying European bark beetle, and has no Dutch elm disease. Nevertheless, two scouts have examined trees in the southern part of the state, and licensed tree surgeons have been requested to send in samples to the State Entomologist, Dr. H. B. Peirson, if any trees are under suspicion. The latest fear is that the recent outbreak near Montreal will spread into northern New England.

Whereas New Hampshire has had no known Dutch elm disease to report, although bark beetles of both kinds are present, light outbreaks had occurred in nearby Massachusetts and in the southern part of Vermont by the beginning of 1947. About the time these trees were discovered, Dr. J. G. Conklin, New Hampshire's State Entomologist, wrote:

"I anticipate that sooner or later we may expect the Dutch elm disease to appear, but just how far away that date may be I cannot tell. I do not believe that eradication of the disease is probable, no matter what method may be used . .

"My personal feeling is that we can best postpone the threat of the Dutch elm disease in New Hampshire by a concentrated program of elm sanitation, particularly within our towns and villages. I believe, further, that we should encourage owners of elms to pay more attention to the control of such defoliating insects as the elm leaf beetle, which can so weaken elms as to render them susceptible to attack by bark beetles at the breeding season."

A stronger statement than this comes from New Jersey, over the signature of Mr. Rex:

"Records from this state supply sufficient and convincing evidence that recurrent defoliation can be responsible for such devitalization of elm trees that death of the tree will ensue."

Vermont, where it is estimated that 75% of the elm trees in the state are shade trees, has so far had only slight infections, where the disease has apparently spread from New York and Massachusetts into the southwestern corner of the state. Federal scouts originally were employed: but now the state plans to continue scouting with its own men. Up to date, according to one report, the towns of Vermont have removed all their diseased trees, but this statement is denied in another. Complete removal, it is admitted, would not be possible if the disease should suddenly spread over a much wider area or take hold in the splendid street plantings of such villages as Bennington and Manchester—an eventuality that is greatly feared. So far, the Vermont trees afflicted with Dutch elm disease have all been small wild trees. The story would be different with the tall old elms of the villages. As a preventive, therefore, the Division of Plant Pest Control in Vermont is planning to inaugurate a DDT spraying program in 1948, in an attempt to kill off the European bark beetles, which have become well established in the southern part of the state. Vermont is endangered partly, it is felt, by lumbering operations, in the refuse of which heavy infestations of both European and American elm bark beetles have been found.

While Rhode Island, with the exception of one tree, has escaped invasion by the Dutch elm disease, the state is enough concerned about the future of its 78,000 elms on or near its streets and highways to establish a scouting, spraying, and research program with the State Department of Agriculture and the State College at Kingston co-operating. At the State College, a full-time research man is employed and a diagnostic laboratory is maintained. While waiting hopefully for Connecticut's experiments in chemotherapy to bear more positive results, Rhode Island is suggesting spraying trees with DDT to repel the elm bark beetles. This method too, it admits, is merely the

What To Do . . .

If You Suspect a Tree of Dutch Elm Disease

Study the symptoms carefully. If they agree with those given on page 56, then send specimens to the Identification Laboratory at East Orange, N. J.

Collect specimens from living or recently dead wood that shows evidence of infection. Avoid extremely dry wood, decayed wood, and crumbly bark; also small dead twigs and green twigs lacking discoloration. They would all be useless in the laboratory.

What to send from each tree suspected:

Six specimens of discolored twigs or branches, collected from different parts of the tree, *or* three slabs of wood from the trunk showing discoloration. Each piece should be about 7 inches long.

Fifty pieces of bark and wood containing galleries, or tunnels, of the elm bark beetle. Each piece should be about 3 inches square.

How to wrap the specimens:

Tie twigs or slabs from each tree securely together with cord or a strong rubber band. Assign a number to each tree and place this number on a label bearing your name, to be attached to each bundle of specimens. (These labels may read, for example, "Smith 1," "Smith 2," etc., to distinguish the trees.)

Place material in a strong paper bag, box, or package, and bind securely. Attach a shipping tag addressed to:

DUTCH ELM DISEASE IDENTIFICATION LABORATORY
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
503 MAIN STREET, EAST ORANGE, NEW JERSEY

Write a letter giving complete information about location of tree or trees, and, if samples are sent from more than one tree, refer to numbers affixed to the tags on the bundles of specimens. Preferably attach the letter, in its envelope, to the outside of the package. If this is not practical, see that your name and address are on both.

A reply may be expected in about two weeks from twig specimens; in a month from beetle galleries.

best expedient known at present, requiring verification by further experimental studies, such as those being conducted in New Jersey in conjunction with Federal authorities.

Dr. Frank L. Howard, Plant Pathologist at Kingston, and Dr. Herbert Knutson, of the Rhode Island Department of Agriculture and Conservation, together feel concerned over the presence of carrier trees—specimens which harbor the fungus, *Ceratostomella Ulmi*, without being materially injured by it themselves: trees which behave like Typhoid Marys in the world of elms. They express the point of view of the plant pathologists in every state when they say:

"Dutch elm disease is certainly in New England to stay and we must learn to live with it."

To this, Dr. Albert E. Dimond of Connecticut adds:

"Emphasis properly belongs on keeping healthy trees healthy, rather than on removing diseased trees. This is the situation which prevails with agricultural crops."

Meanwhile, the Rhode Island recommendation to the citizens is, in addition to spraying with DDT, to keep the existing elms in good condition.

"Research indicates," they say, "that healthy trees are less likely to be infected than defoliated ones. Hence, those practices that enhance the ornamental value of the elm (fertilization,[6] spraying for insect and disease control, and pruning out dead and broken branches) may be used to permit individual trees to escape the disease." [7]

The principal recommendation of Dr. Frederick E. Cole, Commissioner of the Massachusetts Department of Agriculture, is sanitation—burning logs or peeling their bark—for the protection of elms. Considering the number of planted elm trees in Massachusetts—an estimated two million—the proportion of its known 1,052 infected trees in the past eight years is small. The majority of these have been removed and most of them burned at a unit cost of $150. Massachusetts has two scientists doing research on Dutch elm disease control and the entire program in the state is carried out jointly by the State University, the Department of Agriculture, Federal Identification Laboratory and local units. The University has mailed thousands of folders to local groups throughout the state, and has carried on an effective program through newspapers and public-spirited organizations, but still it feels an urgent need for personal contact with private owners of trees.

In the States to the South and West

Indiana has suffered from a relapse in control work. The new cases of Dutch elm disease found there in 1946 were more than the total found in all the previous years together, and the size of the infected area was almost doubled. In Indianapolis, phloem necrosis also occurs.

West Virginia's elms, though few in numbers, are in serious danger, for most of them in the western part are dying from phloem necrosis. The bark beetle population is high in the declining trees, which means that the few survivors are likely to be victims of the Dutch elm disease.

Virginia, where the State removes all trees that are found infected with *Ceratostomella*, has been more fortunate. Although *Scolytus* beetles were

[6] Fertilization, that is, if it is needed. Fertilizers, it has been pointed out, are of value only on trees of low vigor, and it has been shown that they may increase susceptibility if applied to trees in normal or good condition.

[7] Once the beetles have hatched and developed beneath the bark of an unhealthy elm, every surrounding healthy elm is in danger, for it is the vigorous elms on which the beetles preferably feed. It is only at breeding time that weakened elms become a source of infection.

found emerging from logs on the Norfolk docks in 1933 and the disease was first noticed there in 1934-36, it was not until 1946 that the beetle was found well established in the area. The beetle has invaded Virginia from Maryland and West Virginia, as well as from the docks; but so far, deaths of elms in the state have been few.

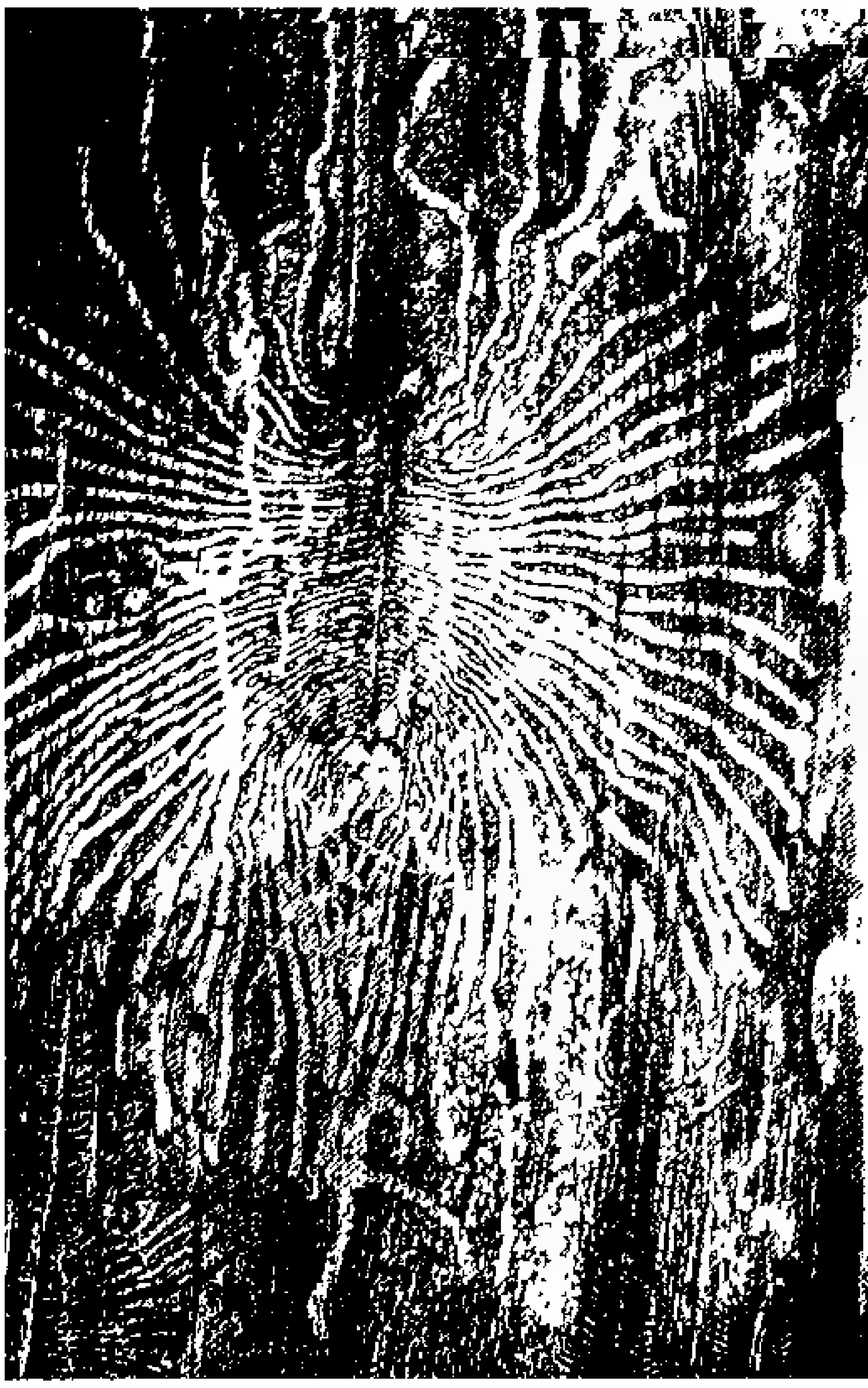
Presence of the European bark beetle is a danger signal for elms, for the fungus is more than likely to appear eventually wherever the beetle has made itself at home. *Scolytus multistriatus* now extends westward through Illinois and across the entire state of Arkansas to Denver, Colorado, from where Dutch elm disease has recently been reported. It has reached well into the southern states and gone northward to Michigan and northwestern New York State.

In Alabama, bark beetles (*Scolytus*) were found for the first time in 1947, particularly around Birmingham, but up to May 1947, no Dutch elm disease had yet been discovered. Scale insects were prevalent, however, on elm trees—a weakening influence. American bark beetles (*Hylurgopinus*) also have been found there, and phloem necrosis was suspected for the first time in the spring of 1947.

No Dutch elm disease and no phloem necrosis had been reported in Louisiana up to May 1947, but the European elm bark beetle was found in the northwestern corner of the state in 1946. Nearby Mississippi, however, had been invaded by *Scolytus multistriatus* and infected with the virus.

Oklahoma elms, according to Government reports, are being weakened by scale and leaf-eating insects, which are exacting a heavy toll there. Bark beetles of both kinds are also present; lumber yards especially are infested with them; but there is no Dutch elm disease as yet. However, last spring, phloem necrosis was found in Oklahoma 150 miles southwest of its previously known limits.

Pennsylvania has had no organized control program except in Gettysburg National Park. According to a 1946 Federal report: "The number of specimens sent to the Identification Laboratory by city foresters, arborists, and property owners, and reports which accompany the specimens, indicate that Dutch elm disease damage increased materially in many towns and other developed areas." However, another report showed only 32 new cases in 1946, as against 170 the previous year and 432 in 1941. With the cessation of the work of Federal scouts, control is now, according to Dr. E. M. Craighead, Principal Plant Pathologist for the State, entirely a local problem, with the State Department of Agriculture offering cooperation with towns and individuals in identification and suggestions for control of the disease. From the beginning in Pennsylvania, efforts have been made to remove weak or damaged wood in areas of infection.



Tunnels made by the European elm bark beetle (left) are easily recognized when the bark of an elm is removed. The female digs an upright cavity 1 or 2 inches long in which to lay her eggs. Each grub which hatches from an egg then excavates its own transverse tunnel, in which it lives, feeds, and grows, shedding its skin from time to time, and eventually emerging as a full-grown beetle. The galleries made by the American elm bark beetle are similar but more irregular.

Woodpeckers are likely to bore into a tree (right) that is already populated with elm bark beetles. Presence of these birds should be a warning to owners of elms.

In Ohio, also, control is left largely to the communities, instead of being handled by the State. A number of municipalities are considering undertaking suppression measures on a community basis this year, according to Dr. Roger U. Swingle, Pathologist in the Division of Forest Pathology of the U.S.D.A. in Columbus. Those contemplating such a program are Marietta, Cleveland, Youngstown, and a few others, especially in northeastern Ohio. The measures being considered are spraying with DDT and destroying dead wood which would make suitable breeding places for bark beetles.

Connecticut's Research Program

"One cannot educate the public if he himself is ignorant of how the disease can be controlled."

With this statement from Dr. Albert E. Dimond as a sort of profession of faith, the Connecticut Agricultural Experiment Station has been doing a great amount of research on the Dutch elm disease. The program was initiated by Dr. James G. Horsfall, Head of the Department of Plant Pathology until his appointment in February 1948 as Director of the

Station. For several years the work has been carried out by Dr. George Zentmyer, now in California, and Dr. Dimond, who is in active charge today. Dr. Dimond has declared further:

"The needs to be met if elms are to be saved are in research on how to control Dutch elm disease by original and untried methods, and not in large expenditures on sanitation and 'education' of the public. Sanitation has not stopped the disease from advancing."[8] Yet, he admits:

"While the disease continues to attack elms, there is no reason yet for believing that the elm is doomed in this area. This is particularly true inasmuch as the trends in control of the elm bark beetle and chemotherapy are new and can be expected to improve in efficiency as time goes on."

The Connecticut station's experiments in chemotherapy have been widely discussed in horticultural, arboricultural, and scientific periodicals in the past year or so. Methods are improving, results are becoming more gratifying, and there is promise of more research with the hope of finding an assured method of treating infected trees in such a way that the symptoms of the fungus will not be exhibited in the tree

At present the most successful method tried has been to apply a solution of the chemical, OXYQUINOLINE BENZOATE, to the soil around a tree. This is taken up by the roots, and when it enters the water-conducting system of the trunk and branches, where the Dutch elm disease fungus has also penetrated, it reduces the virulence of the fungus attack on the tree.

Briefly, according to the latest report from this station, the story is this:

"The past season's work has shown once again that the chemical, oxyquinoline benzoate, reduces severity of the Dutch elm disease, but that treated trees may die of the disease despite treatment. Trees vary widely in their uptake of solutions of the chemical, but a comparison of methods by which the chemical may be applied has shown that pressure injections of solutions into the soil from 18 to 24 inches below the surface of the ground are as effective as any method yet used. There is fragmentary evidence that such treatment protects healthy trees against infection."

Research vs. Scouting

Of the $26,000,000 and more spent on Dutch elm disease in the past 18 years, only a very small part has gone into research. About 75% of this sum, in fact, was relief money, appropriated for the purpose of employing men, and not for any other specific purpose. It is the opinion of Dr. P. P. Pirone, the Botanical Garden's Plant Pathologist, who was one of the

[8] Other Dutch elm disease investigators, however, hold that to stop the disease entirely has not been the intent, but merely to check its advance as much as possible, and this, they believe, has been accomplished. At the Morristown, N. J., experimental control plot, for example, it was reported in 1946, the total number of Dutch elm disease infections found in a three-year period was about one-third the number found in a similar area where no control had been practiced. The fact that in Ohio it was at the same time reported from the Marietta experimental plot that two years of rather thorough sanitation work apparently has not prevented invasion and an increase of Dutch elm disease is laid to the prevalence of phloem necrosis in the same area, the virus-infected trees being ideal breeding places for the bark beetles.

earliest workers on Dutch elm disease control —and many agree with him—that if a larger percentage had been set aside from the beginning for research on methods of control, rather than on the job of scouting for diseased trees, which were often merely left to stand because their numbers were so great, we might today have greater mastery over the epidemic.

Planting Problems

The question arises as to whether park departments and individuals should continue planting elms. Some say not, particularly in the phloem necrosis areas, where there would be double risk, but, viewing the fact that there is concern over the complete disappearance of the American elm. Connecticut authorities respond with the reminder that:

> "There is no surer way of eliminating the elms from this region than to stop planting them altogether, just as a complete birth control program in the human population would be a certain way of decimating mankind. Therefore, if a person is charged with the responsibility of large numbers of trees and feels that the role of the elms in the New England landscape is very important, he might wish to continue planting them, realizing that some of them will die from Dutch elm disease, but that probably some of them will not. We do not believe that Dutch elm disease by itself will eliminate elms."

There is hope in the possibility of breeding elms that will be resistant both to the Dutch elm disease and to phloem necrosis. One, the Christine Buisman elm (named for a Dutch woman scientist who, as a visitor to this country in 1930, aided in the identification of the Dutch elm disease) will not succumb to *Ceratostomella Ulmi*, and preliminary trials indicate that it may also be resistant to phloem necrosis, but it is highly susceptible

Spraying Recommendation for a Suspected Tree

If a tree displaying symptoms of Dutch elm disease is too large to remove and burn immediately, the New Jersey Department of Agriculture at Trenton has advised spraying it promptly according to the following directions:

(a) *Hydraulic sprayer*:—Three quarts of 25% emulsifiable DDT concentrate to 50 gallons of water for an average size tree, *or*:

(b) *Mist blower sprayer*:—Two quarts of 25% emulsifiable DDT concentrate diluted with water to 1 gallon for an average size tree.

An "average size tree" is 50 feet high. More should be applied proportionally if the tree is larger.

* * *

As a result of a conference on elm bark beetle control, which took place in New York City January 23, new recommendations are being prepared for the protection of elms.

HOW TO HELP IN CONTROLLING THE DUTCH ELM DISEASE

I. By Keeping Healthy Elms Healthy

"Control begins with keeping elms strong and healthy, for healthy trees are resistant to bark beetle attack," wrote Dr. Rush P. Marshall in the November-December, 1947, issue of *Trees* magazine. "*The cost of giving an elm tree complete control treatment over a period of 15 years may be less than the cost of removing the tree after it has died.*"

Cornell Extension Bulletin 687 ("Dutch Elm Disease Control"), obtainable from the New York State College of Agriculture at Ithaca, N. Y., gives good advice on how to combat the debilitating effects of poor soil, leaf damage by insects and diseases, insufficient or excessive water supply, mechanical injuries to roots, and leakage from gas mains. Other State Experiment Stations and Departments of Agriculture also have information to distribute without cost.

II. By Eliminating Sources of Infection

The following recommendations (which are concluded with a tenth command: "Keep elms as healthy as possible,") were issued last November 25 by the University of Massachusetts.

1. Remove and burn promptly all elm trees killed by the Dutch elm disease.
2. Remove and burn promptly *all cut elm wood.* (Or obtain and carefully follow directions for spraying it.)
3. Before May 1, prune and burn all dead material from elms. (This date must be earlier in states to the south.)
4. Do not pile elm wood in the open.
5. Do not permit dumping of elm wood with bark attached in city dumps.
6. Don't transport elm wood with bark attached.
7. In all contracts involving elm trees, require the burning or other satisfactory disposal of all elm wood removed.
8. Spray elms to control leaf-eating insects.
9. Enlist support of all municipal departments as well as civic groups and public utilities in the detection and removal of diseased and dead elms.

to the fungus that causes nectria canker. Moreover, it lacks the graceful vase shape that is prized in the true American elm. The U. S. Department of Agriculture, however, has found a number of American elm trees which appear to be resistant to the Dutch elm disease and even more to phloem necrosis, and is now testing all these against both diseases. It is therefore probable that in any large population of elms, others can be found to serve as stock for propagation or breeding.

Such a program would, however, require many years, many workers, and many acres of ground—though the amount of time required to reach the goal would to some extent depend on the amount of effort devoted to the problem. In the meantime, every owner of an elm tree—whether individual, or town, city, or state—has a responsibility to watch that elm, to keep it in perfect health, and, if it is attacked by disease, to follow instructions provided by the State or Federal Government.

On the Cover

The magnificent elm tree standing in front of the house is one which has succumbed to the Dutch elm disease since the photograph was taken. This and all other illustrations used with the above article have been provided through the courtesy of the United States Department of Agriculture.

Propagation of Garden Chrysanthemums

By Alex Laurie

IT is well known that with proper culture a chrysanthemum plant propagated by cuttings in the spring will make as fine a specimen, or a finer one, than an old plant carried over in the garden from the preceding season. This is partially because the wintering of many varieties, even though they may be considered absolutely hardy, is not always successful. In addition, such plants may carry over diseases and insects from the year before, thus presenting an additional problem of control.

The usual method of propagation consists of making cuttings 3 to 4 inches long from the top of the shoots which develop in the spring. These cuttings are placed in boxes or flats, generally of sand, preferably set in a warm light room and watered adequately to keep them from wilting. A new medium that can be used for this purpose is vermiculite (inflated mica). Since it holds a great deal of water, it should be handled with greater care. Growth-promoting dusts may be used to speed the rooting, care being taken to shake off all excess dust prior to insertion of the cutting in the rooting medium. From the sand or vermiculite, the cuttings are transplanted to small pots of soil to continue their growth.

A better method is to lift the mother plants from the beds late in the fall and keep them in a frostproof hotbed or coldframe until spring. Then the same procedure of taking cuttings is practiced, except that each individual unrooted cutting is potted immediately in a 2½-inch pot or band. The potting medium should consist of half sand and half soil. The soil should be sterilized by baking in an oven or running boiling water through it.

As soon as they are potted and watered, the cuttings should be covered with cheesecloth. Thereafter, especially if the plants are subjected to bright light or sunlight, the cheesecloth should be misted with a fine spray of water several times a day. Care should be exercised to prevent the soil in the pots from becoming too wet.

If the cuttings are treated with growth-promoting dusts, roots should begin to develop in about ten days. Then the cheesecloth may be removed and the plants will develop naturally. In this fashion an excellent root system will be produced, and checks in growth which occur from damage to roots during transplanting will be eliminated. When set out in the garden, plants of this character will develop rapidly. The method is worth a trial.

The new method of propagating chrysanthemums published here was described by Professor Laurie in the address he gave on "Chrysanthemums for the Millions" during the annual chrysanthemum program at the New York Botanical Garden last October 24. Mr. Laurie is Professor of Floriculture at Ohio State University.

Eliminating Crabgrass

By R. R. Fenska

CRABGRASS has been a headache to every person who takes pride in maintaining a fine lawn. It is a tough grass which will stand a lot of traffic during the summer months, but when fall comes along turns brown with the first frost and remains brown through the latter part of the year. Furthermore, it doesn't appear in spring until the rest of the lawn is well established for the season.

The writer inherited practically a 100% crabgrass lawn when he acquired his property two years ago. The neighbors had all maintained good lawns and it was no more than courtesy to eliminate a source of infestation and nuisance in the community. But how was this to be accomplished?

A little reading of the literature on the subject established the fact that crabgrass is an annual; that is, it reseeds itself every year. Therefore, raking out the dead grass in the fall and burning it does not eliminate it. It comes up again in the spring from seed in the ground left there by last season's grass.

After the literature had been exhausted, landscape gardeners, greenskeepers at golf courses, and other persons were consulted for advice on the subject. When this information had all been assembled it proved so confusing and contradictory that the writer was at a loss on how to proceed.

For instance, one authority said, "Go over your lawn with a blowtorch and burn all the seed so it will not germinate in the spring." Another said, "Don't do that, it won't do any good." Some one suggested, "Plow up the area and grow a crop of vegetables for a year." Retorted an agricultural authority, "That won't help much."

And so it went until it was impossible to come to a final decision as to just what to do to get a lawn established. Oh yes, most of those consulted said, "Don't try to establish your lawn in the spring." Late in August or early September was the proper time to get a lawn started, they all said. This was in February, and the writer didn't want to delay his lawn until fall. Finally, in desperation it was decided to go ahead with the establishment of the lawn on a basis of common sense plus scientific facts. Our grandfathers had good lawns long before experts on lawns were heard of, so there couldn't be too much mystery about such an accomplishment. The following procedure was finally decided upon and carried out.

First. Soil samples were collected from the area and given to the County Agricultural Agent for analysis with the statement that it was desired to establish a lawn on this type of soil. The report came back that we had a good basic soil for that purpose.

Second. Since we are in a region where the Japanese beetle is a menace to good lawns, it was decided to guard against it by treating the area with the standard application of 10 pounds of arsenate of lead to each 1,000 square feet. This was done about March 1. Incidentally, it has also had the effect of eliminating the ground moles which are sometimes a problem in this region.

Third. Two weeks after the above grub-proofing, a fertilizer was applied at the rate of 10 pounds to each 1,000 square feet. Because of certain chemical reactions it was thought inadvisable to apply the fertilizer and the arsenate of lead at the same time.

Fourth. The best grass seed available was used. The type selected is *very* important, because the best is always the cheapest in the end. By "best" is meant seed from a reliable dealer who can furnish fresh, viable seed of known origin. Seed held over for a year loses much of its viability, or germinating power.

In sowing the seed the writer used 8 pounds to each 1,000 square feet of lawn area. This is more than is usually recommended but there was a reason for it. Since crabgrass will not tolerate shade it was decided to shade out the crabgrass with a dense stand of good grass. The seed was sown ten days after the application of the fertilizer.

Fifth. As soon as the seed had been applied, the area was covered with a black humus; enough to keep the sun from drying out the seed during germination. Once the seed starts to germinate it is hopeless to expect a lawn if the soil is permitted to dry out.

The ground was not rolled, however. Rolling merely packs the soil and drives out the air, which is just as essential to the roots of a plant as the part above the ground. The only time there is any justification for rolling a lawn is in the spring when alternate thawing and freezing during the previous winter have heaved an established turf and left the roots without firm contact with the soil. Rolling under such conditions is essential to the future growth of the turf. However, it should not be done while the ground is still saturated with moisture or in a soggy condition. That will do more harm than good.

Sixth. The proper amount of moisture was applied from the start right through the season. When there was not enough rain, the lawn was sprinkled—but always just enough. Too much water can be as bad as too little. The writer has found it takes less water to maintain a satisfactory lawn if the sprinkling is done after sun-down. It gives the water a chance to get down to the roots before the sun draws it up in the form of vapor.

While the different steps of the above operation were being carried out, the neighbors took a keen interest in the project. Expressions of its success, however, were not too encouraging. The writer's only solace was that he would learn by experience what *not* to do if the venture proved a failure. Of course, everybody watched it closely for a week, and when after two weeks nothing appeared there was consternation and dismay in the family.

Then one morning while we were at the breakfast table my wife began to stare at something outside. In a moment she exclaimed, "Do you see what I see?" Sure enough, there it was, thick as hair on a dog. Against the black humus it looked greener than the grass in Ireland. And it kept right on growing. Finally, when it had reached a height of four or five inches it was cut with the lawn mower set at two inches. As the whirling blades clipped off one row of nice velvety grass after another, it was a great satisfaction to have the audience of neighbors ask, "Say, just how did you do this job?"

It should be noted that the area was not plowed before the lawn was established. No lime was applied to the soil at the start (nor since its establishment). The torch or flame was never used to kill the crabgrass seed in the soil. No rolling has been done during the two years that the lawn has been established. Only a small amount of crabgrass has been able to get its head above the present turf and this has been pulled out as soon as it became noticeable.

From now on the writer anticipates no further serious trouble with crabgrass. The lawn will, of course, receive the ordinary care of raking, fertilization, sprinkling when necessary, and maybe a "Keep Off the Grass" sign if the local traffic gets out of hand.

NOTICES AND REVIEWS OF RECENT BOOKS

To Improve the Soil

COMMERCIAL FERTILIZERS — THEIR SOURCES AND USE. Gilbeart H. Collings. 522 pages, illustrations, bibliography, indices of subjects and proper names. Blakiston Company, Philadelphia. Fourth edition. 1947. $4.50.

The many natural and synthetic substances that are used as fertilizers are discussed in this book. The source, composition, and value of each substance is indicated. Considerable space is given to the results obtained when various fertilizers are used for a crop and to mineral nutrition of plants. Production figures and money value are given for many of the fertilizers in most demand in the U.S.A. Four editions in twelve years is an indication of the popularity of the book. The black and white illustrations are good by present standards; most of the colored plates are off-register and are useless.

F. W. KAVANAGH.

Map-Maker's Outlook

BLACK CARIBBEAN. R. W. Thompson. 286 pages, illustrated. MacDonald & Co., London, 1946. 12/6 net.

Thompson, an officer in the British Army, was called to service early in the war. He was assigned to duty in Jamaica but for some unexplained reason he was able to make a tour of Central America and this book gives his impressions of Caribbean America.

Nature study, history, philosophy and psychology all come from this traveler's pen. Thompson describes in his tour of Central America his visits with Walter Turnbull, Ivan Sanderson, and his stops at places like Tegucigalpa, Belize, Panama City and San Pedro Sula.

Thompson's service job in Jamaica was the compilation of a large scale map of the island. To do this work he explored by car, motorcycle and on foot all the known roads and paths of Jamaica. His account is too general to be of much scientific value to a biologist but as an interesting tale of the people and the country and the philosophy of the English Colonial system, it is good background reading.

R. A. Howard.

Sludge for the Soil

UTILIZATION OF SEWAGE SLUDGE AS FERTILIZER. Subcommittee on Sludge Utilization for Fertilizer of the Committee on Sewage Works Practice, Federation of Sewage Works Association, 120 pages. Published by the Federation, 325 Illinois Bldg., Champaign, Ill., 1946. 75 cents.

This manual is prepared to show the use, value, and limitation, of sewage sludge as a fertilizer. In the "Conclusions," the first item summarizes the volume for the horticulturist or agriculturist.

> "Sewage sludge is of use as a fertilizer and soil conditioner if properly prepared and applied. Its value varies with the type of sludge."

Information is presented showing that the chemical content of sludge will vary considerably from plant to plant and even from day to day in the same disposal plant. A review of the characteristics of different types of sludges, the commercial use of sludge as fertilizer, and the hygienic aspects of its use are given, as well as a discussion of the fertilizer requirements of various soils and crops and how well sewage sludge may meet these needs. To the person contemplating the use of sewage sludge as a fertilizer, this authoritative manual would seem to say, "Sludge is good. It has its limitations and its value will vary. Consult your county agent or local agricultural college as to the value of a particular sludge for the specific purpose you propose."

Francis Elder,
American Public Health Association.

Notes, News, and Comment

Annual Meeting. Seven new members were elected to the Corporation of the New York Botanical Garden at the annual meeting Jan. 14. They are Oakleigh L. Thorne, Mrs. Elliott Averett, Mrs. Montgomery Hare, Mrs. Roy A. Hunt, Mrs. James C. Mackenzie, Mrs. Joseph M. Proskauer, and Mrs. Thomas D. Thacher.

The nine members of the Board of Managers whose terms were expiring were all elected to succeed themselves for a term of three years. These are Arthur M. Anderson, Howard Bayne, Charles B. Harding, Mrs. Albert D. Lasker, Clarence McK. Lewis, Elmer D. Merrill, Henry de la Montagne, Francis E. Powell, Jr., and William J. Robbins.

Officers of the Garden for 1948 are Joseph R. Swan, President; Charles B. Harding and John L. Merrill, Vice-Presidents; Arthur M. Anderson, Treasurer; William J. Robbins, Director; Fred J. Seaver, Assistant Secretary; and Henry de la Montagne, Secretary, Assistant Director, and Assistant Treasurer.

Committees for the year include the following: *Executive* — Edwin De T. Bechtel, Henry F. du Pont, Charles B. Harding, Clarence McK. Lewis, Frederick S. Moseley, Jr., Robert Moses, Mrs. Harold I. Pratt, Marcus M. Rhoades, and William J. Robbins, plus the President and Treasurer; *Finance* — Howard Bayne, Charles B. Harding, Francis E. Powell, Jr., plus the President and Treasurer; *Scientific*—Clarence McK. Lewis, William Felton Barrett, Ralph A. Beals, Marston T. Bogert, Elmer D. Merrill, Herman A. Spoehr; *Horticultural* — Henry F. du Pont, Marian Cruger Coffin; *City Relations* — Mrs. Harold I. Pratt, William Felton Barrett; *Pension*—Arthur M. Anderson, Francis Cormier; *Plans and Development* -Joseph R. Swan, Mrs. Harold I. Pratt, Mrs. Robert H. Fife, Mrs. Elon Huntington Hooker, Arthur M. Anderson, William Felton Barrett, Edwin De T. Bechtel, Clarence McK. Lewis, Francis E. Powell, Jr., and William J. Robbins.

Advisory Council. Mrs. Richard de Wolfe Brixey has been elected Second Vice-Chairman of the Advisory Council, succeeding Mrs. William A. Lockwood, who has held the office since 1939. Mrs. Paul Sturtevant was elected to membership in the Advisory Council at the Annual Meeting of the Garden Jan. 14.

Mrs. Francis King. Louisa Yeomans King, renowned gardener and garden writer, died at the home of her daughter in Milton, Mass., Jan. 16 at the age of 84. She was a member of the New York Botanical Garden.

Besides being Honorary President of the Women's National Farm and Garden Association, Mrs. King had won many horticultural awards during her long gardening career. Among these were medals from the Massachusetts Horticulural Society, the Garden Club of America, and the National Home Planting Bureau. Writing under the name of Mrs. Francis King, she produced a number of books which merited the esteem of serious gardeners, and she also contributed to the leading horticultural magazines. Among her books are "The Well Considered Garden," "Pages from a Garden Notebook," "The Little Garden," "Chronicles of the Garden," and "The Beginner's Garden."

Committee. Dr. P. P. Pirone has been named chairman of the committee on sustaining memberships in the American Phyopathological Society.

Lectures. Dr. Donald P. Rogers addressed the Torrey Botanical Club Feb. 3 on "A Comparison of Evolutionary Tendencies in Plants, Animals, and Fungi."

The Alleghany Garden Club in Pittsburgh heard an address by Dr. William J. Robbins Jan. 23 on "Bacteria, Yeasts, and Molds." Dr. & Mrs. Robbins were house guests of Mrs. Roy A. Hunt while there.

Dr. W. H. Camp addressed the annual meeting of the Horticultural Society of New York Jan. 21 on "Plants and their Wanderings." On Feb. 10 he lectured before the senior students in the horticultural department of the Long Island Agricultural and Technical Institute on "Every Man his own Plant Breeder and Selector." Feb. 2 he talked on plant exploration at a meeting of the Little Gardens Club, an Affiliate of the Botanical Garden.

The Luther Burbank Garden Club of Yonkers, another Affiliate, was addressed by T. H. Everett Feb. 11 on "Begonias and their Culture."

Dr. E. E. Naylor showed "The Gift of Green" and "Plants and the Life of Man" to the Garden Club of Laurence at Cedarhurst, L. I., Feb. 9.

The Advisory Council heard Dr. H. N. Moldenke speak on "Plants of the Bible" at the Garden Feb. 9. On Feb. 13 Dr. Moldenke lectured on the same subject before the Old Greenwich Garden Club, and three days later to the Newark Garden Club.

Visitors. Charles C. Adams, who until his retirement was Director of the New York State Museum at Albany, was a visitor at the Garden February 11. The following day, Mrs. Raymond Watts, Naturalist at the Morton Arboretum, Lisle, Ill., came to the Garden. On Feb. 11 she had lectured before an open meeting of the Conservation Committee of the Garden Club of America in New York on "Adventures in Nature Education." Among other visitors of the past month have been Robert B. Fischer, former student gardener, who is now in charge of the gardens at Mt. Vernon, Virginia; Llewellyn Williams of the Chicago Natural History Museum, Frances M. Miner, Brooklyn Botanic Garden, Elvinia Catherine Di Pasca, New York-born botanist teaching in Buenos Aires, and Maria Elena Ocampo de Muguerza, also from Buenos Aires.

Returned to Oregon. Dr. & Mrs. S. M. Zeller, who had been at the Garden since October, left Jan. 24 to return to Oregon, where he is Plant Pathologist at the Agricultural Experiment Station in Corvallis. He was working here on the Gasteromycetes for *North American Flora.*

Promotion. Ronald B. Townsend, former student gardener at the Botanical Garden, is now Superintendent of the Huntington Botanic Gardens at San Marino, Calif. He succeeds William H. Hertrich, who became Curator Emeritus after serving as Superintendent for 43 years, ever since the gardens were first opened to the public.

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue surface car to Bedford Park Boulevard

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $15.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. $6.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner. 1935. Second edition 1947. $2.

The Bahama Flora, by Nathaniel Lord Britton and Charles Frederick Millspaugh. 695 pages. Descriptions of the spermatophytes, pteridophytes, bryophytes, and thallophytes of the Bahamas, with keys, notes on explorations and collections, bibliography, and index. 1920. $6.25.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50. Foreign postage extra.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Plants of the Holy Scriptures, by Eleanor King, with a check-list of plants that are mentioned in the Bible, each one accompanied by a quotation. Revised from the Journal of March 1941. 23 pages, illustrated. 1948. 25 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal, 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

Catalog of Hardy Trees and Shrubs. A list of the woody plants being grown outdoors at the New York Botanical Garden in 1942, in 127 pages with notes, a map, and 20 illustrations. 75 cents.

Succulent Plants of New and Old World Deserts by E. J. Alexander. 64 pages, indexed. 350 species treated, 100 illustrated. Bound in paper. 1942. Second edition 1944. 50 cents.

Review of Juniperus chinensis, et al by P. J. van Melle. A study of the many varieties and forms of *Juniperus* which have been commonly included in the concept of *J. chinensis.* 108 pages, illustrated, bound in paper. 1947. $2.

Periodicals

Addisonia, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twenty-second volume. Published irregularly. Subscription price, $10 a volume. Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1.50 a year; single copies 15 cents. Free to members of the Garden. Now in its 49th volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.50 each. Now in its fortieth volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers published in co-operation with the American Society of Plant Taxonomists. Subscription price of volumes 1 through 5, $5 a volume ($4 to members of the Society). Now in its sixth volume. Price, $7.50 ($5 to members of the Society).

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. 96 parts now issued. Not offered in exchange. Prices of the separate parts on request.

Contributions from The New York Botanical Garden. A series of technical papers reprinted from journals other than the above. 25 cents each, $5 a volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Contents and prices on request.

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

VOL. 49 APRIL PAGES

No. 580 1948 77 104

APRIL AND MAY EVENTS AT THE GARDEN

Museum Exhibits

Plants of the Tropics—watercolor paintings by Mrs. Charles Platt of Philadelphia, April 20—May 31, in the rotunda.
Eastern Wild Flowers Needing Protection—a new permanent exhibit, with life-size models of a dozen native plants, in cases to the right of the rotunda.

Conservatory Displays

Continuation of the Easter display, with new plants added as they come into bloom, in addition to the permanent exhibits in the conservatory, 10 a.m. to 4:30 p.m. daily.

Outdoor Flowers

Naturalized daffodils and early rock garden plants in late April; flowering shrubs and trees throughout the spring in many parts of the grounds, notably magnolias, flowering cherries and crabs, dogwoods, azaleas, rhododendrons, and lilacs; irises in late May, then peonies; also early bloom in the perennial borders.

Educational Program

Botany for Beginners Six sessions, Mondays, 3—4 p.m., April 12—May 17

Field Botany Seven sessions, Saturdays, 1:30—3 p.m. April 17—May 29

Outdoor Gardening Practice Eight sessions, Thursdays, 7—8:45 p.m.

Garden Contruction Eight sessions, Tuesdays, 7—8:45 p.m. April 27—June 15

Members' Day Programs

3 p.m. in the Members' Room

April	7	*Arrow-Poison Plants of the South American Indians*	*Harold N. Moldenke* Associate Curator
May	5	*Adventures in North Polar Natural Rock Gardens* Joint meeting with the American Rock Garden Society	*Rutherford Platt*

Free Saturday Programs

3 p.m. in the Lecture Hall

April	10	*New Plants from Mexico's Mountains*	*E. J. Alexander*
April	17	*Multiplying Garden Plants*— A lesson in propagation	*E. E. Naylor* Associate Curator
April	24	*Spring in New York City's Back Yards*	*F. W. Raetz* Photographer
May	1	*Mushroom Collecting as a Hobby*	*Donald P. Rogers* Curator
May	8	*Afternoon in Mexico*— Four short motion picture films	
May	15	*Wild Flowers of the New York Area* With kodachrome illustrations	*Walter Shannon*

Radio Programs

"Calling All Gardeners" every Saturday morning from 8:30 to 8:45 over WNYC.

TABLE OF CONTENTS

APRIL 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription $1.50. Single copies 15 cents.

Journal
of
The New York Botanical Garden
Carol H. Woodward, Editor

Vol. 49 | April 1948 | No. 580

Flowers at the Edge of the Polar Ice Cap

The Paradox of Plants that Bloom Vigorously, Without Soil or Rain, in the Teeth of Cold Polar Winds

By Rutherford Platt

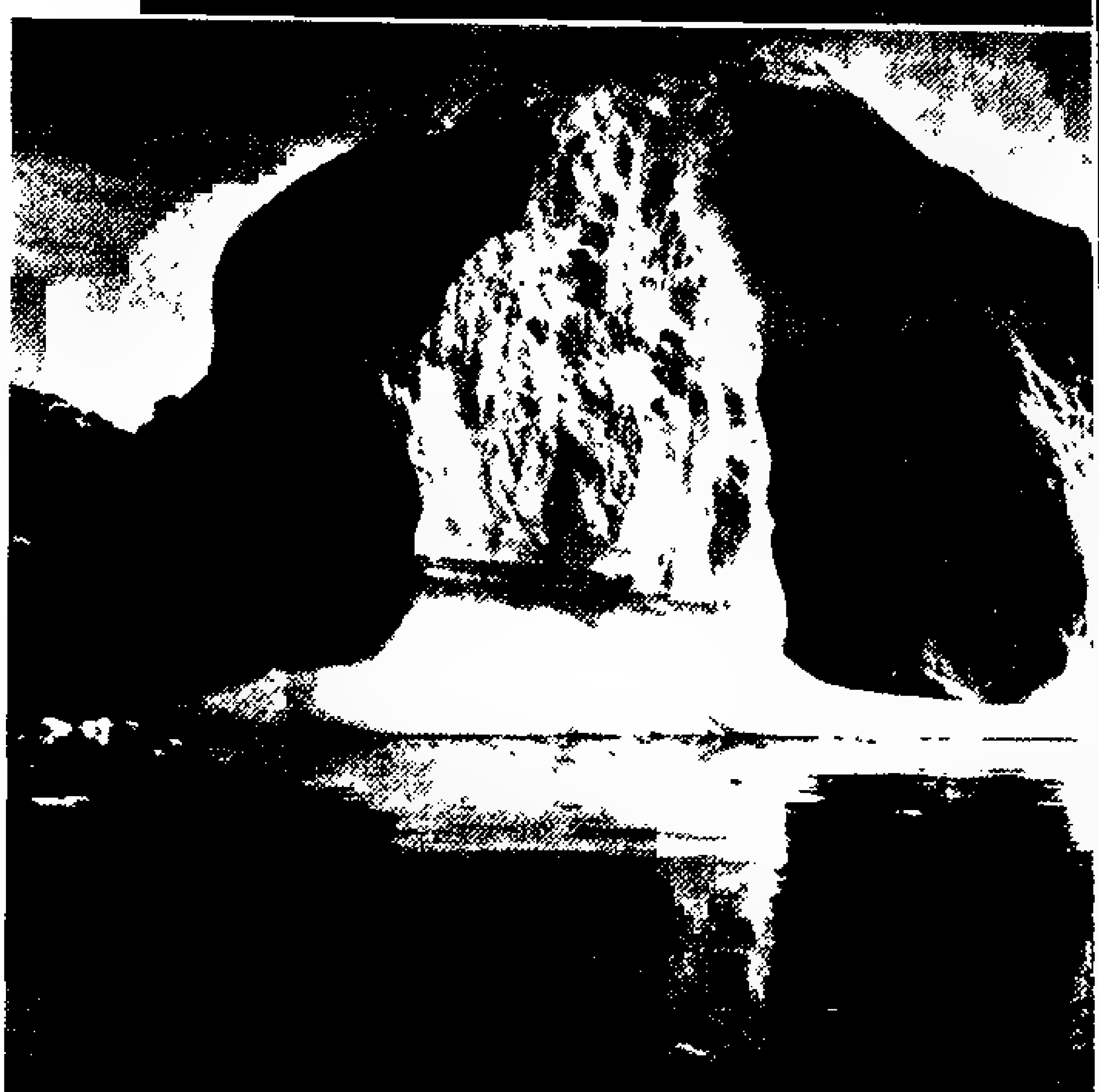
DURING the summer of 1947, Rutherford Platt, author of "This Green World" and "Our Flowering World," sailed through northern waters with Donald B. MacMillan, famous Arctic explorer, on the schooner *Bowdoin*, which has been specially constructed for surviving the ice and rocks of the Arctic regions. The vessel carried its small company and crew as far north as it is possible for a boat to travel—to the edge of the Polar Ice Cap, about 11 degrees from the North Pole. There, in a world that was mostly white, Mr. Platt found a wealth of flowers. Herbarium specimens of the more than 400 different kinds of plants he collected have been deposited at the New York Botanical Garden.

Here he relates part of the story of his trip and of the remarkable vegetation that he saw.

THESE are some notes from a sort of field trip to photograph and collect the plants of the north polar region, and, out of curiosity, to see what kind of plants grow nearest the North Pole.

By good fortune I was privileged to join the crew of the Arctic schooner *Bowdoin*, commanded by Donald B. MacMillan, the famous explorer. No other living man or ship could have gone where we went. We sailed inside uncharted reefs the length of Labrador coast; crossing stormy Davis Strait, we reached Greenland; then worked northward along its west coast a thousand miles farther north, finding open water on the east flank of the ice floes of Baffin Bay. We bucked ice and struck rocks—but MacMillan knew what his stout schooner could do, and always carried us onward.

We traveled almost eight thousand miles round-trip. To do this in the few months when weather permitted, we had to keep going constantly. At



one place in Kane Basin, it was a matter of hours. If the wind had changed to wedge the ice pack at the exit of our little harbor, the *Bowdoin* might have had to stay there a year or two.

This restless, far-flung odyssey offered a marvelous survey of far-northern plant distribution. MacMillan did not hesitate to visit off-the-record spots — places where he himself in all his lifetime of exploration had never been. He likes to poke in here and there wherever an unusual or unknown place beckons. We went to the very head of Inglefield Fjord in Polar Greenland. We stopped at a great nameless glacier and its remarkable moraine where the water was so shallow we had to row several miles to make a landing. We visited Hakluyt and Carey Islands in the north end of Baffin Bay; and we anchored inside the unsurveyed Savage Islands off Baffinland.

The result was a broad survey of plant distribution, rather than an intensive study. Though we hurried on after a few days or even a few hours where it would have been rewarding to linger longer—we collected and photographed plants from 38 stations: 13 in Labrador, 19 in Greenland, 4 in Baffinland, 2 polar islands.

The Ice Pack of the Polar Regions

Plantwise, the tip-top of the world is bald—not because it is too far north, or too cold, but because plants do not grow on sterile ice anywhere. The world wears a white patch of frozen sea on the top of its scalp.

If at the North Pole there were a rocky island, bared of snow by the powerful polar wind, there would probably be flowers, for the slightest cracks would afford entry for roots to tap the water released when the sun melts the surface of the ice. The North Pole would probably bloom at least with foxtail grass, mouse-eared chickweed, and saxifrage, three

SCENES FROM A PLANT-HUNTING EXPEDITION IN THE FAR NORTH

On the opposite page

The author and plant explorer, Rutherford Platt (upper right) had a hand, along with others in the party, in manning the *Bowdoin* as it traversed the ice-bound waters of Davis Strait and navigated up the west coast of Greenland in the summer of 1947. Thousands of icebergs were encountered along the way; waves which broke over the prow of the boat were just above freezing temperature; where the shores were not solid ice, they appeared to be of barren rock, yet it was in the crevices and sheltered spots among these rocks that Mr. Platt found a wealth of wild flowers. The few people who live in these regions apparently love their icy land, as witness the Eskimo mother of Inglefield Fjord, north Greenland, with her three snugly dressed children.

angiosperms which grow on the few acres of low rock of McGarry's Island in Kane Basin, about 11° from the Pole.

The great ice pack, which McGarry's Island faces, began as Pacific Ocean water flowing northward through Bering Strait into the Arctic Ocean. There it froze, but it never stopped moving. For all their ponderous solidity, the thousands of square miles of ice of the Arctic Ocean, harder than concrete, are borne eastward at the rate of about three miles an hour across the top of the world on one of the mightiest of the world's ocean streams. Then, turning south, the polar ice pack splits on the north end of Greenland. Tremendous portions are squeezed through Kane Basin by the irresistible thrust of the basic current on which they are borne.

Flowers in the Face of the Ice

It is impossible to imagine a more bitter and exposed habitat for flowering plants. Standing on McGarry's Island at the height of the summer season, August 8, 1947, I looked upon thousands of square miles of ice which, beyond the horizon, extended continuously to the North Pole. A transparent avalanche of wind poured steadily across that ice, unobstructed, silent, bitterly cold. Nose and fingers tingled. The wind tore at my toque and it was hard to hold the camera steady. Yet with the curve of the rock giving protection in local spots, and slight depressions trapping sunlight, growing conditions are maintained and plants ripen seed in these fantastically hostile habitats. The growing season on McGarry's in the polar ice pack is about six weeks. As for the other 46 weeks, it is interesting to speculate on the adaptations of these perennial herbs that permit the spark of life that is cuddled in their roots to persevere through the long, long subzeros of the polar twilight.

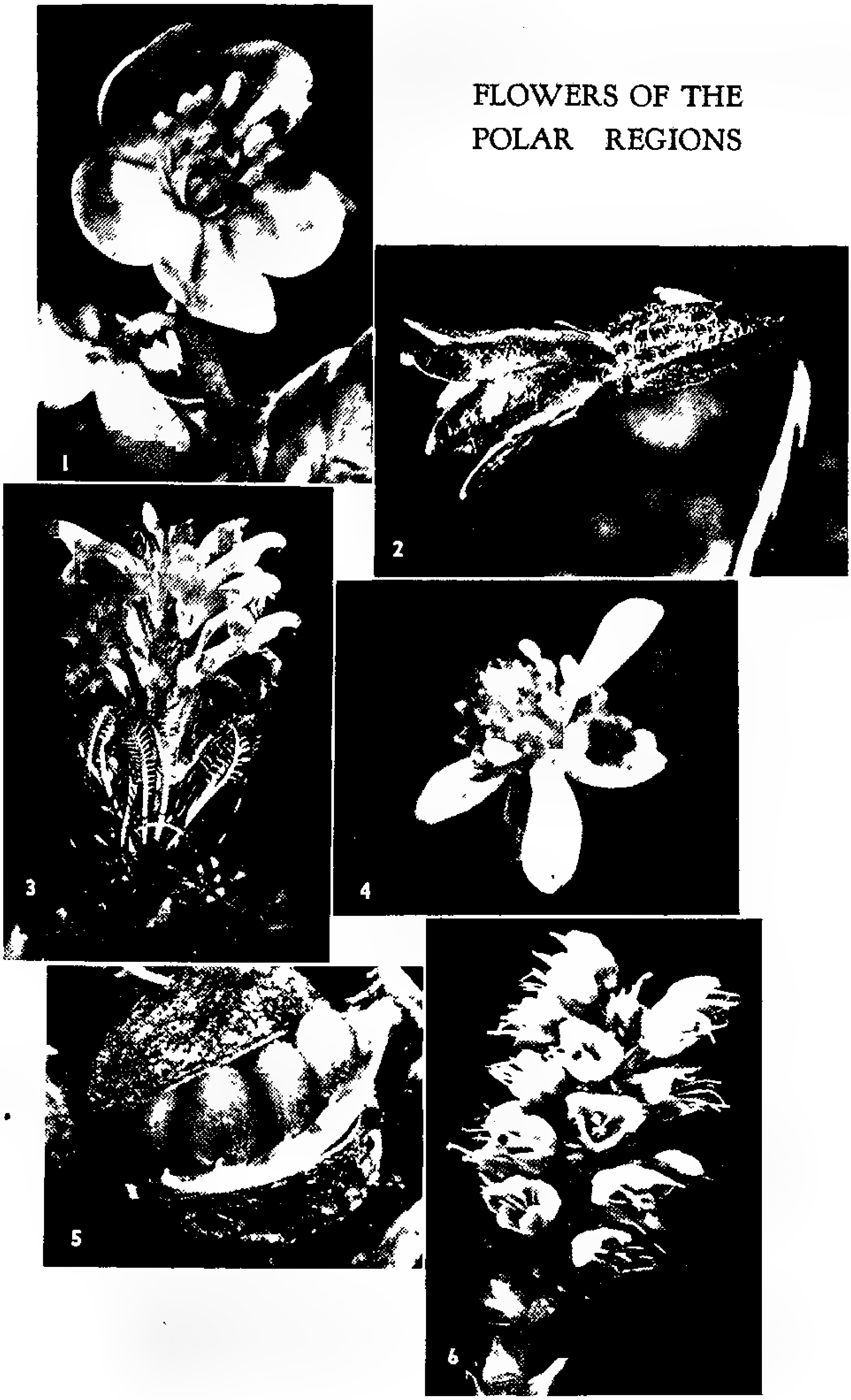
East of McGarry's Island, only a few miles to the mainland, the granite rim of Greenland raises spectacular cliffs and peaks several thousand feet out of treacherous rock-strewn water. Rough beaches, boulder talus slopes, glacier-filled ravines, offer a multitude of habitats protected from the wind

FLOWERS OF THE POLAR REGIONS

On the opposite page

1. The waxy bloom of *Pyrola*. 2. *Campanula uniflora*. 3. An entire plant of *Pedicularis arctica* with rose-purple flowers. 4. One of the buttercups of Greenland. 5. A seed-pod of *Cochlearia*, which ripens rapidly after the passing of the minute white flowers on this small Arctic plant. 6. *Polygonum viviparum*, one of the numerous species of the Far North which reproduce themselves by vegetative buds more often than by seeds. In the few weeks of the growing season there, a plant often has not time to develop its seeds.

FLOWERS OF THE
POLAR REGIONS



and filled with sun. Here are tucked away some of the most brilli robust flowers in the world. The following note from my diar tentative identifications, was made at the time of a visit to this part Greenland mainland overlooking Kane Basin:

REFUGE HARBOR, KANE BASIN

August 11, 1947

A gem of a circular harbor, almost completely surrounded by the mounta rocks. Superb granite gneiss, protected, sun catching—with little brook runnir valley over talus from melting ice above.

This unique high-latitude location holds two especially interesting surprises certain plants that we had found high on the mountainsides were here grov the gravel beach—literally *on,* not just above: *Saxifraga oppositifolia* and *I* Both these were in vigorous bloom on the beach. The other feature was the of the saxifrage (*Saxifraga flagellaris*) that looks like a daddy-long-legs witl curving runners, about 4 inches long—bright red, with bulbil at tip. Collected c and up the brook valley to about 900 feet—where there was a breath-taking the Polar Ice Pack. But gave precedence to photographing. Pools in broo last night with ½ inch of fresh ice.

The rock shuts off the icy winds, but it is below freezing as the midni sweeps behind the northern ridge, throwing the protected valley into shade fo 8 hours every night:

Saxifraga flagellaris—found only at this station.
S. nivalis—abundant here—rare at other stations.
S. rivularis—in full bloom.
S. oppositifolia—growing from beach to 800 feet—finest blooms we have
S. caespitosa—abundant and flowering.
S. tricuspidata—abundant and flowering.
S. cernua—only few of this red bulbil saxifrage, so very abundant elsewh
Polygonum viviparum—scarce, only a few small specimens.
Dryas integrifolia—a few in flower.
Oxyria digyna—high on hill, 300-800 feet.
Ranunculus pygmaeus—1 inch tall.
Papaver radicatum—4-5 inches tall—on beach and also up to 800 feet. Bright and red fall foliage.
Stellaria humifusa.
Poa arctica.
P. abbreviata.
Ranunculus nivalis (past bloom but lots of it. *R. pigmaeus* which was in blooms later than *R. nivalis*).

Famous Arctic Oasis

Towering granite ridges form a beautiful fjord at the entrance tc Basin, north end of Baffin Bay. Here at 78°20′ is Etah, well knc Arctic explorers. Once upon a time a map maker put a dot at E though indicating a community. Since no cartographer has gone t to check up, the dot continues to appear on recent maps of Greenland consists of one miserable little shack with nobody in it. This spec deserted shack is symbolic of man's foothold where the ship-dest monster of the polar pack stretches over the world northward, the icecap of Greenland curves over the skyline eastward, and the glacie mountains of Ellesmereland lie westward.

Here, as nowhere else in the polar regions, does plant life demonstrate what it can do, defying high latitudes and the suppression of long, terrible winter months. Here are notes from my diary made the first week in August at Etah:

ETAH

August 7-10, 1947

Etah, in Foulk Fjord, is a wonderful paradox, an oasis of the Polar Region. The district is an example of the local influence of rock, ice and water on plant life. Here the growing season is limited to six or eight weeks of the year, yet positions of the protecting walls of rock which catch and reflect the sun that shines 24 hours a day, the proximity of a glacier that has built moraines and a pond at the head of the fjord, and a brook from a melting snow bank and ice trapped in a ravine offer everything to quicken and enrich the flora. The plants receive practically no help from precipitation, which is slight. Weather during the growing season in this polar region is apt to be cloudless or occasionally overcast but without rain. Winter, of course, is dry from the extreme cold. But ample surface water comes from the melting of glacial ice. Because the ground is perpetually frozen hard a few inches below the surface, this water is held at the surface, with the result that the bright continuous light can go to work—and work its miracles. This is the secret of Etah. There may be no other place like it in the world . . with the Big Ice above and surrounding it on two sides; the ice pack from Kane Basin at its gates; pack ice mingled with small bergs in its water—the meadow at the head of the fjord, the brookside and the vast talus slopes of the familiar lichen-covered granite gneiss boulders are alive with a profusion of flowers.

Most of the time at Etah was devoted to photography. The effort to reproduce the area pictorially, in all its color, was given precedence over tabulating and collecting. The following is a partial list, additions can be made from the herbarium specimens. Arctic associations are relatively simple, quickly seen in the bright light and unobstructed places, and uniform in a given type of habitat.

(A) Low meadow watered by glacier at head of fjord:

Stellaria longipes	*Saxifraga cernua*
Alopecurus alpinus	*Draba*
Poa arctica, and sp.	*Taraxacum pumilum*
Ranunculus nivalis	*Epilobium* with tiny flowers, shorter pods; broader, smaller leaves. This was near the water on the delta, entirely different in character from the *Epilobium* on the high talus in dry places.
Lychnis affinis	
Cerastium	
Carex sp.	

(B) On esker standing abruptly above meadow. Composed of loose boulders of all kinds, granite gneiss, diabase et al., measuring six inches up to two feet across with some large boulders.

Saxifraga rivularis—many blooms, best we have seen of this

S. tricuspidata	*Carex nardina*
Papaver radicatum	*Salix arctica*

(C) Lateral moraine of boulders beside glacier. This was a steep slope facing the sun, and exposed also to the full glare from the side of the glacier. Plants grew to within 10 feet of the ice; almost touching it, except that the rush of water from the ravines and caverns of the ice had cut away the soil. Eloquent of the power of light, this unique habitat in the terrible chill of that hard cold monster, produced the tallest and most robust specimens seen in the Far North:

Ranunculus nivalis -abundant and in full bloom
Papaver radicatum—flower stalks 10 inches tall
Cerastium alpinum—clumps loaded with flowers.
Alopecurus—10-12 inches tall—one measured 18 inches

(D) Granite gneiss talus, many acres in extent, facing southward behind the protection of the cliffs—plant life began about 50 feet above tide level and reached to top some 500 feet up!

Epilobium 250 feet up, very dry
Arnica alpinum—in grassy place some 100 feet above water
Vaccinium uliginosum—fall foliage, many leaves at tips of branches extra large—I called them balloon leaves.
Cassiope tetragona—abundant on highest rocks, many flowers
Pyrola grandiflora
Pedicularis hirsuta
P. capitata, on far western flank
Saxifraga cernua
Salix arctica
Saxifraga oppositifolia—high up—many flowers
Stellaria longipes
Eriophorum angustifolium
Papaver radicatum
Dryas integrifolia—many blooms, many twists, some in later stage with seeds unraveled and resembling those of clematis.
Festuca supina
Oxyria digyna
Cerastium alpinum
Empetrum nigrum (not so abundant—not found elsewhere above Melville Bay)
Woodsia ilvensis—one colony under boulder 400 feet up in excessively dry places, but leaves green and fresh, and covered on back with sori.
Erigeron uniflorus—occasional, flowering, but rays not fully expanded.

(E) Brook from melting snow, just to east of Etah's one house. (This house not occupied, it is filled with filth—litter and debris of Eskimos that have passed that way for years.)

	Taraxacum
Saxifraga stellaris	*Salix arctica*
S. tricuspidata	*Alopecurus*
S. oppositifolia	*Cerastium alpinum*
S. nivalis	*Papaver*—even grows in tiny crack about ½ inch,
S. cernua	in broad smooth surface of rock.

Teloschistes lychneus (flame lichen) achieves the honor of most conspicuous plant at Etah. It paints the cliffs red; they glow in the sun. A monumental exhibit of lichen color.

Polar Region versus Tundra

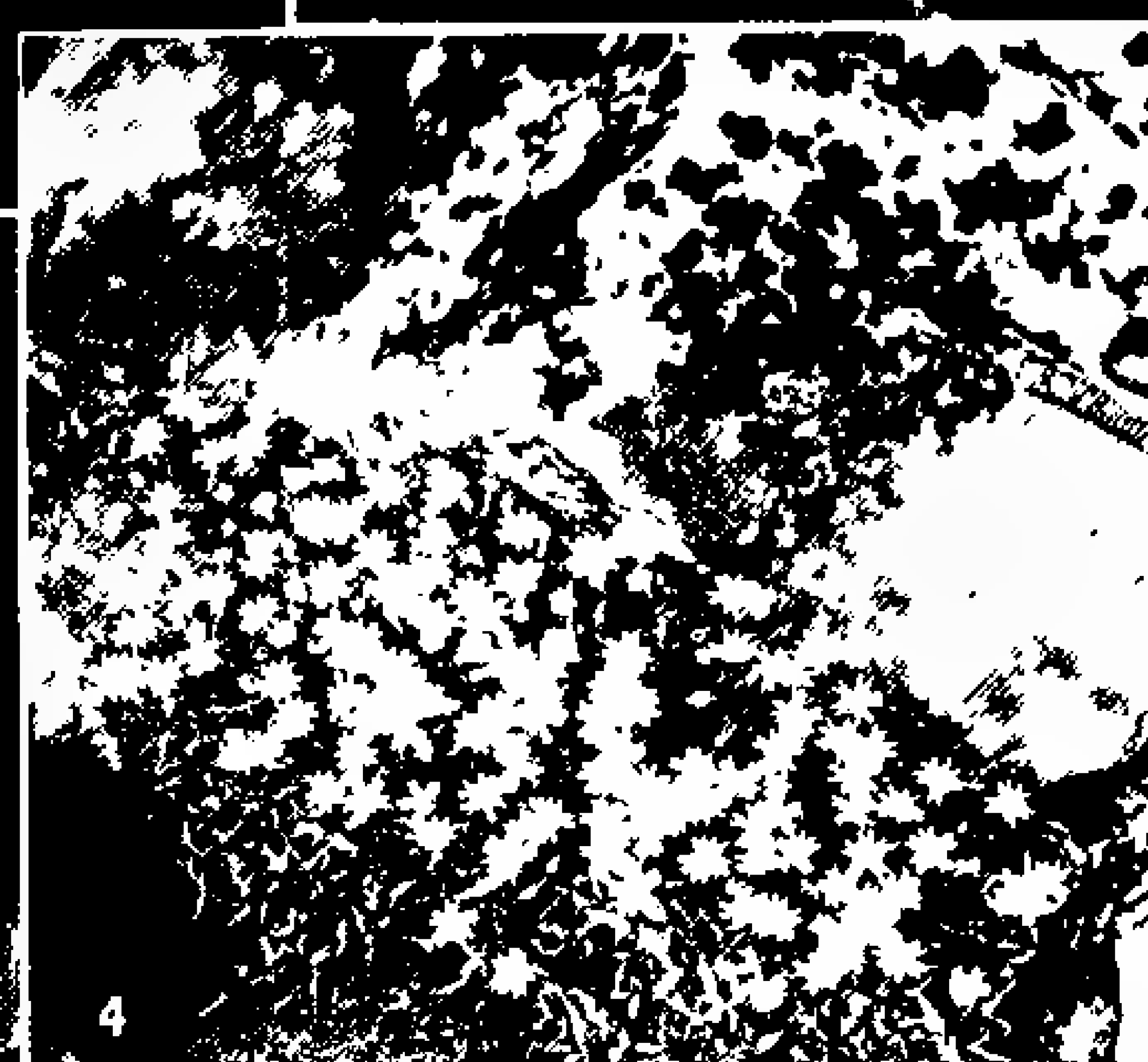
We are here considering the polar region as distinct from the mid-Arctic. Around Hudson's Bay and westward to Alaska stretches the vast tundra region. Labrador, with a wealth of boreal plants, is characterized

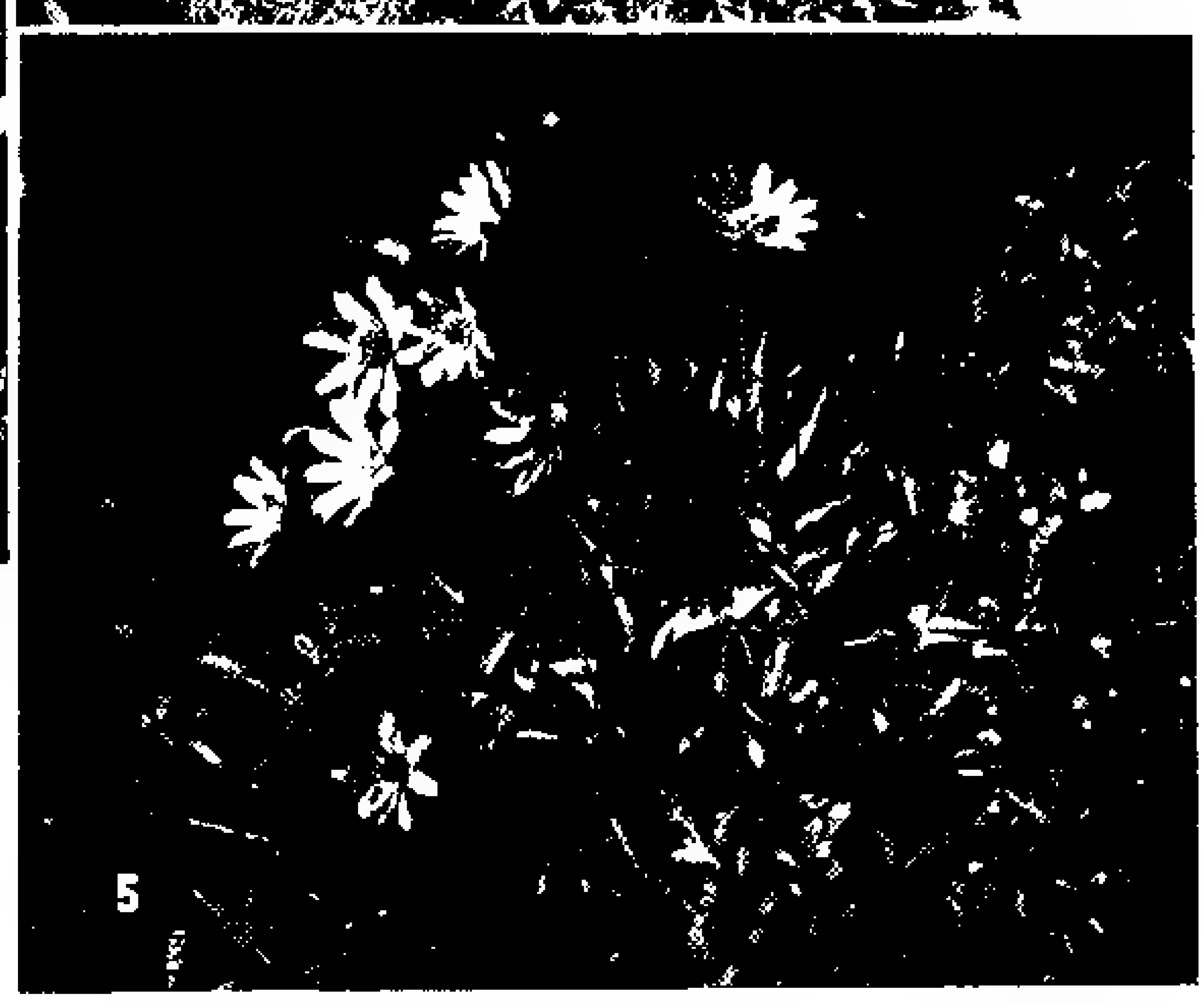
A VIVIPAROUS SAXIFRAGE AND OTHER ARCTIC FLOWERS

On the opposite page

1, 2, and 3. *Saxifraga flagellaris;* 2, showing the viviparous bud at the end of a stolon (greatly enlarged) and 3, showing the cactus-like leaves, also enlarged. 4. *Cerastium* in the crevice of a lichen-covered rock. 5. *Arnica* flowering at the deserted outpost of Etah.

A VIVIPAROUS SAXIFRAGE AND OTHER ARCTIC FLOWERS





by sphagnum bogs and heavy precipitation. There are local bogs and considerable rain also in southern and mid-Greenland. But far above the Arctic Circle, from about 76° northward, in the polar region of North Greenland there is no sphagnum bog, very slight precipitation, no soil in the usual sense, no ground water, hence no springs. Conditions for plant life are unique. There is some correspondence with desert vegetation. Plants form dense clumps, with heavy tap-roots. Leaves are leathery and thick, conserving their moisture by cutting down transpiration. But the most unique aspect of polar flora is the extremely miniature size of the plants. Most of them are perennial herbs averaging an inch or so tall. There are a few woody plants, chiefly the Arctic willow, birch, and bilberry. The willow and birch have no resemblance to trees, even very small trees. They form flat mats as though a steam roller had ironed them out, and their leaves are a fraction of an inch in size.

There is no continuous ground cover, as in other parts of the world. In some depressions there may be a small association, but polar plants are characteristically scattered. They snuggle singly beneath the curve of boulders. From a little distance they are invisible. You have to search to find them. The airplane visitor of the future who zooms over the natural rock gardens of North Greenland will declare that the rocks are bare and sterile.

Most of Greenland is buried by the continental glacier. The rim of rock around the coast is only 2% of that little known island. Plant life is confined to rocky promontories, valleys, and mountainsides in a narrow ribbon of pre-Cambrian granite for many hundreds of miles along the coast. The Big Ice forms a flat dome, about 8,000 feet deep in the interior. This glows white in the sunlight, but it does not tower high in the great perspective. It makes a long horizon that can be seen between mountains and forms a background for every rocky vista in the north. Its fingers come down to the sea in big glaciers. Between the sea and the ice cap, with the sun not setting but going around and around the horizon, the temperature and humidity are remarkably stable. During the summer, that is, the few weeks of the growing season, the sunlight is turned on plant life 24 hours a day. With constant temperature, plants have achieved marvelous vitality and bloom freely in astonishing abundance. They are always to be found on the boulder talus slopes that are very common. These slopes are often as steep as 45°, and still the plants nest among them. So avid is plant life in the presence of the bright light and the mineral solutions from the rocks that flowers grow horizontally from cracks in vertical rock.

The direct rays of the sun both day and night, plus reflections from rocks and from ice and snow which lie in patches everywhere, create superb light conditions, which account for the vigorous flowering, even though the plants are generally stunted. The drainage of the talus boulder slopes is such that plants get practically no help from the slight precipitation. And there are no springs. Water is provided by the ice cap primarily. Its fingers, the glaciers, gush streams. Every glacier resounds with the voices of many brooks. Added to that, every ravine or protected place behind a steep cliff has ice or snow trapped the year around, and this becomes a reservoir of local water in summer. This water from melting ice and snow does not drain downward through the mighty depths of the talus or the cracked rock—but it is trapped and spreads out just beneath the surface boulders.

All this is an eloquent exhibit of the fact that plant life can exist with nothing more than light and free water released by direct radiation of sunlight. Temperature above the freezing point seems to matter little. Sturdy herbs grow in the icy air at the face of the glacier, as seen at Etah, where the radiation of light is intense. Also the freest blooming plants grow high up on the mountains, where the skylight and rock reflections are at a maximum—witness the bluebells, cassiope, purple saxifrage, that are always found high up. They began above 400 feet and grew even more lustily at a thousand feet.

In closing, let us explore a polar island with my diary notes made at the time. We arrive there about 2 a.m. and immediately go ashore with cameras:

HAKLUYT ISLAND—NORTH END OF BAFFIN BAY

August 14, 1947

A rocky crag rising to a height of about 1000 feet with sheer cliffs, but a gradually ascending series of sandstone terraces sloping from the sea on the westward side. These terraces offered the only opportunity for inspecting this island botanically—and progress was confined by deep ravines and snow and ice surrounding the sandstone terraces. A feature of the place was the presence of thousands of birds—murres, kittiwakes, puffins, little auks, black guillemots. They blanketed the rocks where they rested—and made lines of hundreds of birds on the narrowest terraces of the cliffs. This fact undoubtedly affected the soil on the broad sandstone terraces. It was black, raw humus in the form of undulating hummocks like a featherbed. Because seed plants were scant, this raw humus must have been built by the lichens and mosses and bird fertilizer through hundreds of years. There was not a trace of what we call soil—and despite the extreme aridity, no dust. The wealth of lichens was beyond description, and they were far more luxuriant on the raw humus than on the rock. In the perspective of lichens, moss was not conspicuous but a great deal of it nevertheless, forming deep if somewhat scattered cushions.

The six seed plants observed:

Alopecurus alpinus (one colony).
Poa abbreviata (very dense, cespitose, and dry—2 inches tall—occasional throughout area)
Carex capitata (3 inches tall)
Saxifraga rivularis (leaves only)
S. stellaris (inflorescence remains, branching, about 3½ inches tall)
Cerastium alpinum (leaves only)

It would be hard to imagine a more hostile habitat anywhere in the world. The pack ice below and stretching to the horizon—freezing the wind. Unobstructed gales from the Greenland Ice Cap to the east and Ellesmere's eternally icy mountains to the west. The silent power of light prevails!

Rhipsalis—And Plant Distributions In The Southern Hemisphere

By W. H. Camp

IN a recent issue of this Journal our good friend Dr. Harold E. Anthony discussed the ever-recurrent problem of the presence, in Africa, of material of the primarily American, epiphytic cactus genus *Rhipsalis*.[1] His conclusion was that it was introduced into the Eastern Hemisphere by man. It is heartening to the plant geographer to note that so eminent an authority on animal distributions should discount the idea, usually advanced, that the seed of this material was carried eastward across the vast stretches of the Atlantic by birds. This is as it should be, for such glib explanations have beclouded the main issues of plant dispersal much too long. On the other hand, the problem does ramify considerably beyond the situation in *Rhipsalis*.

It certainly is a correct attitude to suspect the possible intervention of man in such matters before we make any rash statements concerning wide distributional disjunctions. For example: When Michaux, the European plant explorer, came to America over a century ago he found a beautiful rose, common and abundant in thickets in parts of what are now our southeastern states. It was unknown to botanists of his day and so it was christened *Rosa laevigata;* it is the Cherokee rose of the South and the state flower of Georgia. We have since learned, and much to our regret, that it is not native. It has been said that the "Cherokee" rose was carried down the time-worn trade routes from its real home in China to grace the ancient gardens of Persia, thence taken to Moorish gardens in Spain, later brought to Spanish gardens in St. Augustine, Florida, whence it escaped. In any event, it has become a well established and common plant which since has spread widely in our Southland with all the appearance of a real native.

However, when the plant geographer makes a careful survey of the facts on a larger scale, he is immediately struck with several items. This is especially true in the Southern Hemisphere, where the lands are widely separated by vast stretches of ocean. In the first place there are 11 families of plants—usually so specialized in form that there is little possibility that errors of relationship among their members could be made—whose distributions are limited to the combined African and South American regions. This list would be greatly increased were we to include those much larger, primarily tropical, plant families with members in South America, Africa and southern Asia (often with Australia thrown in for good measure).

---

[1] Jour. N. Y. Bot. Gard. 49: 33-38. 1948.

In addition to these 11 families of plants which are limited to what we might call the Afro-South American region, there are about 95 genera of plants with this same distribution. Usually these have the bulk of their species on one continent with only a few on the other; rarely are the species about equally divided. To these 95 might be added an additional series of what are called "paired genera"—that is, groups of species so similar that, had they occurred on the same continent, they might well have been placed in the same genus. The reason that they usually have not been perhaps is the result of human inertia, super-caution on the part of some taxonomists, the acceptance of tradition by others, or, probably more often, because of incomplete studies wherein the material of Africa, for example, was examined without consulting that of South America at the same time. The lack of adequate collections also hinders this work, for almost every expedition into tropical west Africa or northeastern South America uncovers additional evidence of forms "bridging the slight morphological gap" between these "pairs." Or, again, this list of 95 genera would be increased by several hundred if we were to include those which occur in both South America and Africa and also in southern Asia. The dispersion areas of many of these are so startlingly similar to the present total distribution of *Rhipsalis* that we immediately become suspicious of a close parallel of some sort.

That this problem of what at first glance appear to be unusual distributions is not confined to the Afro-South American sphere is demonstrated when we examine other parts of the world. For example: 5 families of plants are known to be limited to the Australia-New Zealand and South American areas; and about 35 genera, often in various other families, have this same distribution.

When we examine the 11 families and 95 genera which biologically connect South America and Africa, and the 5 families and 35 genera which similarly connect South America with the Australia-New Zealand area, one striking thing stands out: Only rarely are they plants which might have been carried about by man, either as weeds or as ornamentals. In brief, these 16 families and 130 genera pose a very real problem for those studying the mechanics of natural plant dispersals—these, and the many additional subgenera and closely related species-groups in other more widely dispersed genera which as yet have not been subjected to critical analysis.

There is neither opportunity nor space here to deal adequately with the factors of plant dispersal. However, these curious and challenging distributions in the Southern Hemisphere are among the various facts which have led an increasingly large group of plant geographers (among them myself) to feel that, perhaps, various of these continental masses once were much more closely associated than they are at the present time; that these families and genera, apparently with "peculiar" distributions, already were evolved and considerably dispersed while these now disjunct continental masses were yet connected- -and before they drifted apart. This theory of "continental displacement" is a much-argued one and many papers and various weighty tomes, sometimes with acrimonious arguments, have been written by biologists and geologists on its pros and cons, much as geologists and biologists once argued heatedly over another fundamental principle which they both now accept—over evolution. Until geologists ultimately settle their part in the present debate over the mechanics of continental displacement (and many, on the basis of their own evidence, are turning with favor to it), the plant geographer can do no more than present the mass of rapidly accumulating facts concerning the surprising number of closely related groups (families, genera, and possibly even a few species) which do have quite natural distributions in the Southern Hemisphere on continental masses now separated by thousands of miles of open ocean.

The epiphytic cactus *Rhipsalis* may have been introduced by man into Africa from America, much as the seemingly wild Cherokee rose, a native of China, appears to have been introduced into Florida by the Spaniards. But such examples of effective plant dispersal by man—effective in that they subsequently established themselves in their new homes—do not negate the fact of numerous naturally dispersed disjuncts in other groups. These constitute the real problems facing the plant geographer.

Actually, it would seem that the problems of the plant geographer are but little different from some of those of the student of animal distribution. Backeberg,[2] in discussing the situation in *Rhipsalis*, mentions several genera of scale insects which are common to South America and Africa, as well as the snout beetle, *Rhyncops,* which is common to South America and Africa, venturing even beyond India, thus fairly closely paralleling the present distribution of *Rhipsalis.* The snake genus *Corallus,* according to this same author, occurs in northern South America (a hotbed of *Rhipsalis*) and also in Madagascar (where several form of *Rhipsalis* have been described).[3]

---

[2] Desert Plant Life **20**: 13, 14. 1948.

[3] After this was written, Dr. Anthony informed me that some time ago herpetologists split the *Corallus* assemblage into two genera, one South American, the other Madagascaran. In this connection it might be well to note that, in general, taxonomists dealing with vertebrate animals tend to "split" genera more finely than do those dealing with vascular plants. Traditionally, taxonomy is an analytic rather than synthetic science; it seeks to find differences between organisms rather than demonstrate their community of characters. Therefore when a student adventures into the systematics of a group of organisms with the *a priori* basic philosophy that organisms which occur as geographically widely disjunct groups cannot belong in the same genus, even those admittedly related, he usually has little difficulty finding characters by which they may be "split." With such a basic concept, what ordinarily would be

Ernst Mayr[4] also notes, for example, the presence of the white-faced whistling duck in South America, Africa, India; the Muscovy duck group in America, Africa, India; and the southern ruddy ducks in Africa, South America and Australia.

Backeberg further refers to Kummer's work on the anatomy and systematics of the rhipsalids, wherein that author concluded that, with one exception, the African forms of *Rhipsalis* are indigenous. In a letter Dr. Anthony has noted the variability of *Rhipsalis* now in Africa. The species in America also are variable in their native haunts and it may well be that Kummer was straining to find significant differences in the African material; in fact he, himself, admitted that they were not too well marked. But it also must be admitted that—as with the cacti in general—the differences between certain species of *Rhipsalis* rest on rather tenuous characters. What is needed is a re-analysis of the entire genus, complete with additional explorations, breeding tests, cytological and morphological studies—in brief, an examination of all pertinent matters—before this oft renewed controversy over the African materials of the genus can be settled.

The purpose of this note, then, is not to joust with Dr. Anthony over whether or not the African forms of *Rhipsalis* are indigenous or introduced—either in part or in their entirety. It is merely to point out that, in my opinion, the discussion ought to be left open, especially in the light of the great number of genera known to have completely natural Afro-South American distributions, as well as the presence of an additional large group of genera which venture further as does *Rhipsalis*—into Madagascar and also into southern, tropical Asia. These latter, as I have pointed out elsewhere,[5] are the great pantropic plant genera whose ancestral roots apparently were in the southern lands. As may be seen from their writings, the presence of disjunct distributions in many predominant Southern Hemisphere groups—plant and animal—greatly disturbed the students of the past, such as Hooker, Wallace, Darwin, Guppy, and a host of others. With the explorations and resultant accumulated knowledge of the past century, the magnitude of the biotic complexities of these southern continents is only now beginning to be fully realized. Much more exploration and detailed study will be needed before the curious pattern of the distributional disjunctions of large parts of their floras can (or will be) fully understood.

---

no more than subgeneric, sectional, or even specific characters within the group can easily be magnified—with no pricking of the scientific conscience—into "generic" characters. Without this philosophical (one is tempted to say psychological) "block" on the part of many taxonomists, there would be considerably more genera of plants with a common Afro-South American distribution than the 95 which now are admitted.

[4] Wilson Bull. 58: 3-41. 1946. (p. 14).

[5] Ecol. Monog. 17: 159-183. 1947.

PLANTS THAT SERVE MANKIND AND WHERE THEY ORIGINATED

Botanical Garden's Exhibit at International Flower Show Wins Gold Medal Certificate

THE world and some of its most important plant products appeared at Grand Central Palace March 8-13 as the annual exhibit of the New York Botanical Garden at the International Flower Show. The Garden was awarded a gold medal certificate.

On continents painted in blending reddish and coppery tones, elevated above golden areas of ocean, nearly 200 products that are derived from plants were exhibited, each one placed as nearly as possible in the region of its geographic origin.

The rear wall of the exhibit was ornamented by two "trophies" of farm and garden implements, sheaves of grain, and ample baskets spilling over with many colorful varieties of vegetables and fruits. These trophies were composed like the memorials of victory, made of weapons of war and booty of the enemy, which early Greeks and Romans erected. Emblems in this style of classic trophies, which often contained objects bearing relation to the owner and his interests, were painted on walls in France around the time of Louis XV and XVI. The New York Botanical Garden trophies were designed and executed by Mrs. Charles Burlingham and Mrs. Grafton H. Pyne.

The object of the Garden's display was to show, *not* the areas from which our cultivated plant products are derived today, but the region where each plant species concerned is believed to have originated in the wild. This meant that pineapples were *not* shown in Hawaii; white potatoes in neither Ireland nor Maine; quinine and rubber not in the East Indies, where both products have long been grown almost exclusively; but that all four of these important products (with 27 others) were shown in South America, where they all originated. And coffee was not shown in Brazil, where more than half of the world's supply is grown today, but in that part of the Near East which lies close to Africa.

As very few plants, particularly those that have been developed for economic use, can be traced back to any one small spot on the globe, it was obviously impossible to place a basket containing a fruit, grain, fiber, vegetable, or other product on the exact spot where the ancestor of the plant in use today may have evolved into something like its present form. A score of our most common food plants, for example—apples, lentils, peas, barley, asparagus, and lettuce among them—cannot be assigned to a native home any more specific than the bicontinental land mass known as Eurasia. Some

The list (pages 95-99) gives the common and botanical name of each plant shown, its principal use, and the approximate region where it was displayed on the world map.

The plant names are followed by a short list of books and periodicals either devoted to plants of economic use or in which references to them can be found. All of these may be consulted in the library of the New York Botanical Garden, which is open daily except Sunday from 10 to 5.

Many of the plants whose products were shown may be seen growing in the Botanical Garden's conservatories, which are open daily from 10 to 4:30. Admission is free at all times. Some of the products are being incorporated into museum exhibits.

The Flower Show exhibit, which occupied an area 38 x 18 feet, was planned and carried out by a committee headed by T. H. Everett and consisting of Michael Cangero, R. A. Howard, E. E. Naylor, A. C. Pfander, G. L. Wittrock, and Carol H. Woodward.

of these were therefore placed inside the borders of Europe, some in Asia. The plants of Mediterranean origin posed a similar problem, for many of them have been known from ancient days to occur in the wild on the northern, eastern, and southern shores of this great sea. These plant products were therefore similarly divided into adjacent sections of Europe, Asia, and Africa.

Those who lingered to study the map were able to see that the bulk of the world's important food crops originated, in both the Eastern and the Western Hemisphere, in the same concentrated areas where early civilizations are known to have reached the highest peak—in the Mediterranean region and in the high plains of the Andes—regions where the equable climate was conducive to good crops and comfortable living.

Besides the food plants shown—and these included grains, fruits, vegetables, nuts, sugars and starches, beverages, spices and flavorings—medicinal products from plants played an important part in the exhibit. Fibers too were shown; also sources of perfumes, dyes, fats and oils, resins, rubber, and tobacco.

The products in the exhibit—some of which arrived by air from distant places just in time—represented only a small proportion of the plants in actual economic use throughout the world. Many of the others were not readily available, and there would have been no space for them on the crowded portions of the map if they had been obtained. The aim was to select the most widely used products from all parts of the world.

People who are accustomed to dividing the earth into the Old and New Worlds—the regions corresponding essentially to the Eastern and Western Hemispheres, the Western not having been known to the world of the Eurasian and African ancients until after Columbus made his discovery—could readily pick out interesting facts about the origins of our principal food plants, especially. All of our grains except corn, for example, came from the Old World. This means that no one in Europe, Asia, or Africa knew Indian corn, or maize, until it was carried there from America close to the beginning of the 16th century. The majority of our common vegetables also originated in the Old World—carrots, asparagus, lentils, peas, radishes, beets, cucumbers, soybeans, spinach, parsnip, celery, chicory, artichokes, broad beans, garlic and onions, and the cabbages and all their relatives. Yet the New World has contributed, in addition to corn (which must be classed as a vegetable and a commercial product as well as a grain), lima beans, also string beans and their close relatives—navy, kidney, black beans and a number of others; potatoes, both white and sweet, tomatoes, and green and red sweet peppers.

The New World furnish chocolate and vanilla, also a vanilla-like flavoring from South America called coumarin. Maté or Paraguay tea also comes from there, but Chinese tea and coffee are purely of Old World origin.

Plant Products Shown in Botanical Garden's Exhibit

PLANT PRODUCTS OF EURASIAN ORIGIN

Shown on the map of Asia in the exhibit

Common Name	Botanical Name	Principal Use
Apple	*Malus sylvestris*	food
Barley	*Hordeum vulgare*	grain
Endive	*Cichorium Endivia*	food
Hops	*Humulus lupulus*	brewing
Oats	*Avena sativa*	grain
Parsley	*Petroselinum crispum*	herb
Radish	*Raphanus sativus*	food
Valerian root	*Valeriana officinalis*	medicine

Shown on the map of Europe in the exhibit

Aniseed	*Pimpinella anisum*	spice
Asparagus	*Asparagus officinalis altilis*	food
Chestnuts	*Castanea sativa*	food
Chives	*Allium schoenoprasum*	herb
Grapes	*Vitis vinifera*	food
Henbane	*Hyoscyamus niger*	medicine
Lentils	*Lens esculenta*	food
Lettuce	*Lactuca sativa*	food
Mustard	*Brassica nigra*	flavoring
Onions	*Allium cepa*	food
Pears	*Pyrus communis*	food
Peas	*Pisum sativum*	food

PLANT PRODUCTS OF ASIATIC ORIGIN

Agar	*Gelidium, Eucheuma, Gracilaria* and others	medicine, food, laboratory uses
Asafoetida	*Ferula asafoetida*	medicine
Bamboo	*Arundinaria, Bambusa, Cephalostachyum* and others	food, building
Banana	*Musa paradisiaca* var. *sapientum*	food
Bay leaves	*Laurus nobilis*	flavoring
Buckwheat	*Fagopyrum esculentum*	starch
Camphor	*Cinnamomum camphora*	medicine
Carrots	*Daucus carota* var. *sativa*	food
Chick peas	*Cicer arietinum*	food
Cinnamon	*Cinnamomum zeylanicum*	spice
Cloves	*Eugenia caryophyllata*	spice
Cucumber	*Cucumis sativus*	food
Eggplant	*Solanum Melongena*	food
Ephedrine	*Ephedra sinica and E. equisetina*	medicine
Grapefruit	*Citrus paradisi*	food
Hemp	*Cannabis sativa*	fiber
Jute	*Corchorus capsularis*	fiber
Kumquat	*Fortunella japonica and F. margarita*	food
Lemon	*Citrus limonia*	flavoring
Lime	*Citrus aurantifolia*	flavoring
Locust bean or Carob	*Ceratonia siliqua*	food
Loquat	*Eriobotrya japonica*	food
Mustard greens	*Brassica juncea*	food
Orange	*Citrus sinensis*	food

Pepper (condiment)	*Piper nigrum*	spice
Pistachio	*Pistacia vera*	food
Plantain banana	*Musa paradisiaca*	food
Ramie	*Boehmeria nivea*	fiber
Rhubarb (edible)	*Rheum Rhaponticum*	food
Rhubarb (medicinal)	*Rheum officinale*	medicine
Sandalwood	*Santalum album*	perfume
Soybean	*Glycine max*	food
Spinach	*Spinacia oleracea*	food
Tea	*Thea sinensis*	beverage
Tung	*Aleurites Fordii*	paints, varnishes, etc.
Turmeric	*Curcuma longa*	spice
Wheat	*Triticum aestivum*	grain
Yams	*Dioscorea alata*	food
Yautia	*Xanthosoma violaceum*	food

PLANT PRODUCTS OF EUROPEAN ORIGIN

Broccoli	*Brassica oleracea botrytis italica*	food
Brussels sprouts	*Brassica oleracea* var. *gemmifera*	food
Cabbage	*Brassica oleracea* var. *capitata*	food
Calendula	*Calendula officinalis*	flavoring, medicine
Cauliflower	*Brassica oleracea* var. *botrytis*	food
Celery	*Apium graveolens* var. *dulce*	food; seed for spice
Chamomile	*Anthemis nobilis*	medicine
Collard greens	*Brassica oleracea* var. *acephala*	food
Ergot	*Claviceps purpurea*	medicine
Fennel seed	*Foeniculum vulgare*	spice
Filberts	*Corylus Avellana*	food
Garlic	*Allium sativum*	flavoring
Irish moss	*Chondrus crispus*	food
Kale	*Brassica oleracea* var. *acephala*	food
Lavender	*Lavandula officinalis*	perfume
Parsnips	*Pastinaca sativa*	food
Prunes	*Prunus domestica*	food
Raisins	*Varieties of Vitis*	food
Rutabaga	*Brassica Napobrassica*	food
Turnip	*Brassica Rapa*	food

PLANT PRODUCTS OF AFRICAN ORIGIN

Aramina	*Urena lobata*	fiber
Areca	*Areca catechu*	masticatory
Bowstring hemp	*Sansevieria thyrsiflora*	fiber
Dates	*Phoenix dactylifera*	fiber
Gum arabic	*Acacia senegal*	mucilage, medicine
Kola	*Cola nitida*	flavoring for beverage
Natal plum	*Carissa grandiflora*	food
Tamarind	*Tamarindus indica*	food, flavoring

PLANT PRODUCTS OF MEDITERRANEAN ORIGIN

Shown on the map of Asia

Fava, or Broad Bean	*Vicia faba*	food
Licorice	*Glycyrrhiza glabra*	medicine, flavoring
Orris root	*Iris florentina*	perfume

Shown on the map of Europe

Almonds	*Prunus amygdalus*	food
Beets	*Beta vulgaris*	food
Chard	*Beta vulgaris cicla*	food
Chicory	*Cichorium intybus*	food
Saffron	*Crocus sativus*	flavoring, dye
Squill (white)	*Urginea maritima*	medicine
Sugar beet	Variety of *Beta vulgaris*	sugar

Shown on the map of Africa

Artichoke	*Cynara Scolymus*	food
Colchicum	*Colchicum autumnale*	medicine, laboratory
Flax	*Linum usitatissimum*	fiber
Leeks	*Allium porrum*	food
Mastic	*Pistacia lentiscus*	medicine, resin, etc.
Squill (red)	Variety of *Urginea maritima*	rat poison

PLANT PRODUCTS OF NEAR EASTERN ORIGIN

Belladonna	*Atropa belladonna*	drug
Coffee	*Coffea arabica*	beverage
Coriander	*Coriandrum sativum*	spice
English walnut	*Juglans regia*	food
Henna	*Lawsonia inermis*	dye
Pomegranate	*Punica granatum*	food
Senna	*Cassia acutifolia and C. angustifolia*	medicine

PLANT PRODUCTS OF POLYNESIAN ORIGIN

Abacá	*Musa textilis*	fiber
Akee	*Blighia sapida*	food
Bel fruit	*Aegle marmelos*	food
Benzoin	*Styrax tonkinense and S. benzoides*	medicine
Coconut	*Cocos nucifera*	food
Dasheen	*Colocasia esculenta*	food
Figs	*Ficus carica*	food
Ginger	*Zingiber officinale*	flavoring
Golden coconut	*Cocos nucifera* var. *aurea*	food
Kamala	*Mallotus philippensis*	medicine, dye
Kava Kava	*Piper methysticum*	sedative, beverage
Nutmeg	*Myristica fragrans*	flavoring
Pandanus	*Pandanus tectorialis*	fibre, food
Pigeon pea	*Cajanus Cajan*	food
Rice	*Oryza sativa*	grain
Sugar cane	*Saccharum officinarum*	sugar

PLANT PRODUCTS OF AUSTRALIAN ORIGIN

Eucalyptus	*Eucalyptus*	medicine
Nux Vomica	*Strychnos nux-vomica*	poison, medicine
Queensland nut	*Macadamia ternifolia*	food
Strychnos	*Strychnos spinosa*	food

PLANT PRODUCTS OF NORTH AMERICAN ORIGIN

Avocado	*Persea americana*	food
Black walnut	*Juglans nigra*	food
Butternut	*Juglans cinerea*	food
Canada balsam	*Abies balsamea*	laboratory use
Cascara	*Rhamnus Purshiana*	medicine
Ceriman	*Monstera deliciosa*	food
Chayote	*Sechium edule*	food
Cranberry	*Vaccinium macrocarpon*	food
Guayule	*Parthenium argentatum*	rubber
Henequen	*Agave fourcroydes*	fiber
Hickory	*Carya ovata*	food
Jalap root	*Ipemoa purga*	medicine
Jerusalem Artichoke	*Helianthus tuberosus*	food
Juniper	*Juniperus communis*	flavoring
Maple sugar	*Acer saccharum*	sweetening
Milkweed	*Asclepias syriaca*	fiber
Mushroom	*Agaricus campestris*	food
Pecan	*Carya Pecan*	food
Piñon nut	*Pinus edulis*	food
Redwood fiber	*Sequoia sempervirens*	insulation
Sarsaparilla	*Smilax officinalis ornatus*	flavoring for beverage
Sassafras	*Sassafras albidum*	flavoring, medicine
Senega root	*Polygala senega*	medicine
Sisal	*Agave sisalana*	fiber
Spanish moss	*Tillandsia usneoides*	fiber
Turpentine	*Pinus palustris*	paint industry
Vanilla	*Vanilla planifolia*	flavoring
Wild rice	*Zizania aquatica*	food

PLANT PRODUCTS OF WEST INDIAN ORIGIN

Guava	*Psidium guajava*	food
Barbados cherry	*Malpighia glabra*	food
Papaya	*Carica papaya*	food

PLANT PRODUCTS OF SOUTH AMERICAN ORIGIN

Annatto	*Bixa Orellana*	dye
Black bean	Variety of *Phaseolus vulgaris*	food
Brazil nut	*Bertholletia excelsa*	food
Cashew	*Anacardium occidentale*	food
Cassabanana	*Sicana odorifera*	food
Cassava	*Manihot esculenta*	food
Chicle	*Achras sapota*	gum
Chocolate	*Theobroma cacao*	food, flavoring beverage

Corn	*Zea mays*	food
Cotton	*Gossypium hirsutum*	fiber
Ipecac	*Cephaelis ipecacuanha*	medicine
Kidney beans	*Variety of Phaseolus vulgaris*	food
Maté	*Ilex paraguariensis*	beverage
Navy beans	*Variety of Phaseolus vulgaris*	food
Peanut	*Arachis hypogaea*	food
Peppers	*Capsicum frutescens* var. *grossum*	food
Pineapple	*Ananas comosus*	food
Pita floja	*Aechmea magdalenae*	fiber
Potato	*Solanum tuberosum*	food
Rubber	*Hevea brasiliensis*	industry
Quassia	*Quassia amara*	medicine
Quinine	*Cinchona*	medicine
Tapioca	*Manihot esculenta*	food
Ties or eggfruit	*Lucuma nervosa*	food
Tobacco	*Nicotiana tabaccum*	smoking
Tonka beans, or Coumarin	*Dipterix odorata and D. oppositifolia*	flavoring
Soap-bark	*Quillaja saponaria*	soap
String beans	*Phaseolus vulgaris*	food
Sweet potato	*Ipomoea batatas*	food
Tomatoes	*Lycopersicon esculentum*	food
Vegetable ivory	*Phytelephas macrocarpa*	buttons

Selected Books and Periodicals for General Reference

Oakes Ames. Economic Annuals and Human Cultures. 1939. Botanical Mus. of Harvard Univ., Cambridge, Mass. $4.00.

L. H. Bailey. Hortus Second. 1941. Macmillan, N. Y. $6.00.

F. O. Bower. Plants and Man. 1925. Macmillan, London (Out of print).

W. N. Clute. Useful Plants of the World; 3d ed. 1943. W. N. Clute, Indianapolis, $3.75.

R. O. Cummings. The American and His Food; rev. ed. 1941. Univ. of Chic. Press. $2.50.

U. P. Hedrick. Sturtevant's Notes on Edible Plants. 1919. (Out of Print).

A. F. Hill. Economic Botany. 1937. McGraw-Hill Book Co., N. Y. $4.00.

H. F. Macmillan. Tropical Planting & Gardening; 5th ed. 1943. Macmillan, London. $7.25.

W. W. Robbins and F. Ramaley. Plants Useful to Man; 2d ed. 1937. Blakiston, Phil. $3.25.

E. E. Stanford. Economic Plants. 1934. Appleton-Century, N. Y. $5.50.

A. H. Verrill. Foods America Gave the World. 1939. L. C. Page, Boston. $3.00.

C. M. Wilson. New Crops for the New World. 1945. Macmillan, N. Y. $3.75.

Economic Botany. New York Botanical Garden. $5 per year.

Foreign Agriculture. Supt. of Documents, Washington 25, D. C. $1.50 per year.

Chemurgic Digest. 350 Fifth Ave., N. Y. C. $5.00 per year.

Journal of the New York Botanical Garden. Bronx Park, N. Y. 58, N. Y. $1.50 per year.

NOTICES AND REVIEWS OF RECENT BOOKS

"Finest of Its Type"

GARDENING. Montague Free. 550 pages, illustrated, indexed. Second edition, 1947. Harcourt, Brace, New York. $4.

This revised edition of Mr. Free's book called "Gardening" is without doubt one of the finest of its type obtainable at this time.

Not only should it be of great help and encouragement to all amateurs, but of interest to the old-time professional as well, affording many hours of enjoyable reading during the "off" season.

The different sections covered in this book take care of all problems likely to beset the amateur gardener, from the time he purchases his area of ground for home building down to the last detail of expert care for the upkeep of the grounds.

It is hard to pick out any chapters of the book that are better than others, but a few that will be especially helpful to the new home gardener are those on Soil Improvement, Lawns, also Flower Beds and Borders. Soil improvement usually stumps the beginner, but in this book it is very well explained, and its understanding is augmented by the chapter on Manures and Fertilizers. We all know it is quite easy to go and purchase any of the recommended fertilizers at the local dealer, but the why and when of their use is something all amateurs would do well to comprehend.

The chapters on lawns and on flower beds and borders will solve many of the beginner's gardening puzzles. Roses are well taken care of, and the seasonal care from planting to giving them winter protection is presented in a concise and practical manner.

All kinds of vegetables are listed, but wisely no varieties are given. During these days of hybridizing and improving on existing varieties, any mentioned today may be discarded a few years hence. Coldframes and hotbeds are other subjects of interest, with good illustrations of their construction.

Plant propagation is something that always interests the gardening novice, and the various articles and illustrations on this topic alone make the possession of this really admirable book on gardening worth while.

ARTHUR W. KING,
"Northview," Mt. Kisco, N. Y.

"A Book of Outstanding Merit"

WOMAN'S HOME COMPANION GARDEN BOOK. Edited by John C. Wister. In six parts, 1024 pages, illustrated, indexed. Foreword by Liberty Hyde Bailey. Published by Doubleday by arrangement with Crowell-Collier and P. F. Collier & Son. 1947. $4.95.

Here is a really wonderful book on gardening, well composed and written in simple terms, easy to understand.

In Part I the reader will find the answers to all his questions on whether this or that plant can be grown successfully in his section of the country.

Part II contains some excellent material on landscaping, backed by sound advice, and some very helpful plans to study for ideas on arrangement and selection of plants. One so often sees beautiful homes completely spoiled in outside appearance by the wrong material having been used in foundation as well as landscape planting. This section of the book has been culled from the knowledge of some of our outstanding authorities on horticulture today, and it reflects great credit on them for their contribution toward making this book what it is.

I feel sure that no one who reads this book can do so without grateful appreciation of the valuable information given also on soils (a very important matter), as well as on propagation, planting lawns and other parts of the grounds and the maintenance thereof.

The encouragement of garden friends is not forgotten, nor the keeping in check of garden enemies—or their destruction entirely. These parts are well worthy of praise because of the definite and accurate methods of control recommended.

Part III, dealing with plant material, again is well handled, being composed by a thoroughly competent group of horticulturists. One need not hesitate to accept the advice presented here, knowing it is the work of some highly skilled authors. Part IV, which is equally well made up, gives cultural practices for some of our most popular groups of garden plants.

In Part V one finds different styles of gardening which deserve attention, such as rock gardening, city gardens, and the wild garden, to name only a few. Also in this part very complete advice is given on arranging the herb garden, now becoming popular; likewise on the work of planning and preparing the vegetable garden, as well as work in the greenhouse and frames, both heated and cold, all very ably put together by highly efficient writers.

The importance of botanical knowledge to the horticulturist is difficult to overestimate. A sound background is given in Part VI.

The colored illustrations in the book are excellent, and the various drawings and half-tone photographs should be a helpful guide to the amateur. A well arranged glossary completes what I consider to be a book of outstanding merit in the horticultural field of today.

James B. Jack,
Mt. Kisco, N. Y.

Praying Mantis Tale

STRANGE VISITOR. Edith F. Johnston. 72 pages, illustrated by the author. Macmillan, New York. 1947. $2.50.

Gardeners have come to know the value of the praying mantis for keeping plants freed of insect pests, but they have known little, except by hearsay, of the life story of this weird and fascinating insect. Until Edith Farrington Johnston's beautifully illustrated book appeared, there has been no popular volume —and very little in technical vein—on the praying mantis. Mrs. Johnston's observations and drawings, over many years of close association with these insects, have been made with such fine attention to detail that at least one entomologist has said that she has revealed some new facets of mantis behavior to scientists.

The story and pictures have been published as a children's book, but I would defy any adult, layman or scientist, not to delight in it and learn from it.

Carol H. Woodward.

Inducement to Travel

EXPLORING OUR NATIONAL PARKS AND MONUMENTS. Devereux Butcher. 160 pages, illustrated. Oxford University Press, New York, 1947. $2.75.

The numerous beautifully illustrated books on the national parks of the United

States which have appeared in recent years make one scarcely content to stay at home. The newest one to appear shows mountains and forests, caverns and lakes, deserts and waterfalls, plants and animals, on page after page, with just enough text to tease one's imagination and make one's feet itch to travel.

Leading Plant Centers Of the Continent

THE ARBORETUMS AND BOTANICAL GARDENS OF NORTH AMERICA. Donald Wyman. Chronica Botanica, Vol. 10, No. 5/6, pp. 395-498, illustrated, indexed. 1947. Waltham, Mass.: The Chronica Botanica Co., New York: Stechert-Hafner, Inc. $1.50.

Collections of labeled growing plants and trees known as botanical gardens and arboretums existed in ancient times, but today they have become laboratories for the scientist, sources of inspiration for the horticulturist, and educational centers for the student and layman.

This comprehensive guide is the most complete directory of its kind. It lists and describes a total of 90 arboretums and botanical gardens in North America. Information includes the function of each, type of collections, number of species and varieties, ownership, yearly operating budgets, and other pertinent facts. At the same time, there are a few instances in which some of the statements are incorrect because they are already out-of-date.

When one considers that there are now being planned 24 new arboretums or botanical gardens in 18 different states, it is significant that professional planners as well as civic-minded leaders in many communities will be greatly aided by Dr. Wyman's contribution contained in the chapter "How to Establish an Arboretum or Botanical Garden." By reading this part, one is initiated into the whys and wherefores of planning, gaining support, managing, even labeling and mapping these important plant centers.

Aside from the many professional botanists and plantsmen who will find they cannot be without this guide for reference purposes, it is pleasant to think of the host of intelligent amateurs, both gardeners and botanists planning trips to various parts of the country, whose excursions will be greatly enhanced by visiting the wonderful outdoor plant and tree collections described in these pages.

The volume represents the successful completion of an enormous task of painstaking research by the author and it is fortunate that his experience as horticulturist at the Arnold Arboretum has enabled him to contribute much original material. Both Dr. Wyman and the American Association of Botanical Gardens and Arboretums, which sponsored the questionnaires used in compiling the book, are to be congratulated.

W. STEPHEN THOMAS, *Director, Rochester Museum of Arts and Sciences.*

Notes, News, and Comment

Britton & Brown. Copies of the three volumes of Britton & Brown's "An Illustrated Flora of the Northern United States and Canada" are again available at the New York Botanical Garden, after having been out of print for several months. This is another reprint of the second edition. The price is $15.

Bible Plants. The two articles on plants of the Bible which appeared in the Journal for March 1941, when the New York Botanical Garden exhibited Bible plants at the International Flower Show, have been reprinted in booklet form for the first time and are on sale at the Garden for 25 cents a copy. Eleanor King is the author of the leading article, "Plants of the Holy Scriptures." This is followed by a list of more than 120 plants that are mentioned in the Bible, with a quotation for each one. The entire booklet, which is illustrated, is based on the research of Dr. H. N. Moldenke.

Staff Conferences. Under the title of "Physiological Summaries," the monthly conference of the staff and students of the Garden March 25 dealt with the work of the laboratories under the direction of Dr. W. J. Robbins. Hassan M. Yousef presented an investigation of the requirements of some Basidiomycetes for specific essential metabolites; Dr. Marjorie Anchel explained the extraction and purification of antibiotics, and Dr. Frederick Kavanagh spoke on bioluminescence.

At the conference of Feb. 26, "A Discussion of Classification" was the topic. Dr. R. A. Howard gave a modern classification of the plant kingdom; Dr. D. P. Rogers spoke on relationships of the fungi; and Dr. W. H. Camp closed the discussion with "The Psilopsida — a Problem in Classification."

Associate Editor. Dr. H. N. Moldenke has been named an Associate Editor of the journals *Herbertia* and *Plant Life.*

Visitors. Dr. Ivor Vickery Newman, who until recently was in the Department of Botany at Victoria University College, Wellington, New Zealand, spent the day at the Garden March 23. Upon returning to the Pacific region, he will become Professor of Botany at Ceylon University, Cinnamon Gardens, Colombo.

Dr. Alma G. Stokey of Mt. Holyoke College came to the Garden March 1 to make some studies of tropical ferns.

Dr. Th. van Eek, microbiologist with the Central Sugar Company of Amsterdam, Holland, visited the Garden March 16 with Dr. T. van Hulsingha. The two men are touring the country inspecting penicillin production plants and laboratories. When Dr. van Eek was here in 1946, he was with the General Agricultural Experiment Station at Buitenzorg, Java.

Dr. W. Lawrence White, scheduled to become Curator at the Farlow Herbarium, Harvard University, April 1, to take the place left vacant by the death of Dr. David H. Linder in December 1946, was at the New York Botanical Garden March 19. At that time he was attached to the Biological Laboratory of the Philadelphia Quartermaster Depot.

Among other visitors of recent weeks have been Dr. John R. Reeder, of Yale University with Mrs. Reeder (Charlotte Goodding); Alvaro Fernández of the Instituto de Ciencias, Bogotá, Colombia; Otto Trevino, Guayaquil, Ecuador; E. Hauser, Zurich, Switzerland; A. R. Davis, Dean of the College of Letters and Science, University of California, Berkeley; Merrill K. Bennett, Executive Director of the Food Research Institute at Stanford University; S. C. Damon, Brown University; W. H. Dix, Cornell; Thomas C. Haddon, Duke; W. H. Dix, Philadelphia Academy of Sciences; and H. K. Svenson, American Museum of Natural History.

Artist. Two of the pictures being shown in the spring exhibition of the Bronx Artists' Guild in the Museum Building are oil paintings by Eduardo Salgado, an artist employed at the New York Botanical Garden. They are entitled "Cactus Gatherers" and "Daily Toil," the latter showing a Mexican woman with a jug under her arm.

Lectures. Dr. William J. Robbins addressed the annual meeting of the Fairchild Tropical Garden in Coconut Grove, Florida, March 23. In Lancaster, Pa., March 11, he spoke on "Japanese Agriculture" before the Rotary Club. The Yonkers Rotary heard him Feb. 26 on "A Visit to Japan." The evening of March 11 he spoke on his journey to Japan at a meeting of the Lancaster branch of the American Association for the Advancement of Science. On March 17 he addressed the Plainfield, N. J., Garden Club. "Some Aspects of the Problem of Growth in Plants" was Dr. Robbins' subject at the Sloan-Kettering Seminar at Memorial Hospital, New York, March 4.

Dr. A. B. Stout spoke before the Mt. Vernon Garden Club, an Affiliate of the New York Botanical Garden, March 15 on "Daylilies—Old and New." Another Affiliate, the Garden Club at Ardsley-on-Hudson, heard Dr. W. H. Camp March 16 on "The Origins of Garden Plants."

Dr. H. N. Moldenke was the speaker at the annual meeting of the Newark Museum Nature Club Feb. 27, with the subject, "A Naturalist in Florida." He talked on "Plants of the Bible" March 1 for the Little Gardens Club of Greenwich Village. Dr. H. W. Rickett spoke on "Methods of Science" at the Gedney Way Seminary in White Plains March 13, and Dr. Donald P. Rogers addressed the Hartsdale Garden Club March 17 on "Native Shrubs and Trees for the Garden."

The Torrey Botanical Club heard Dr. Richard A. Howard speak on "Following Ekman's Footsteps in Santo Domingo" March 17. At Newport, R. I., Feb. 28, Dr. Howard talked on "Cuba, the Island of Sugar" before the Newport Art Association; he lectured at the Brooklyn Institute of Arts & Sciences Feb. 10 on "Jungle Housekeeping" and before the Worcester County Horticultural Society Jan. 15 on "A Naturalist Explores Florida."

THE NEW YORK BOTANICAL GARDEN

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue surface car to Bedford Park Boulevard

Membership in
THE NEW YORK BOTANICAL GARDEN
and what it means

TO THE INSTITUTION, membership means support of a program that reaches several hundreds of thousands of persons annually.

Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

TO THE INDIVIDUAL, membership means, beyond the personal gratification of aiding such a program, these privileges:

Free enrollment in courses up to the amount of the annual membership fee paid.

A subscription to the Journal, to "Through the Garden Gate" and to Addisonia.

Admission to Members' Day programs and use of the Members' Room also at other times.

A share of plants when made available for distribution. (These plants may include the Garden's new introductions into horticulture.)

Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

Business firms may become Industrial Members of the New York Botanical Garden. Information on the classes of Industrial Membership and the privileges of membership will be sent upon request.

* * * *

Classes of membership in the New York Botanical Garden in addition to Industrial Memberships are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
Sustaining Member	25	Fellow for Life	1,000
Garden Club Affiliation	25	Patron	5,000
Fellowship Member	100	Benefactor	25,000

Contributions to the Garden may be deducted from taxable incomes.

Contributions to the Garden are deductible in computing Federal and New York estate taxes.

A legally approved form of bequest is as follows:

I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of*____________________

Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

VOL. 49
No. 581

MAY
1 9 4 8

PAGES
105-128

LATE SPRING EVENTS AT THE GARDEN

Members' Day Program

3 p.m. in the Members' Room

June 2 *Choosing and Growing Herbaceous Peonies* — *Harriette Rice Halloway*

Free Saturday Programs

3 p.m. in the Lecture Hall

May 8 *Afternoon in Mexico—*

Four short motion picture films

May 15 *Wild Flowers of the New York Area* — *Walter Shannon*

With kodachrome illustrations

This concludes the free Saturday programs for the season. The series will be resumed Oct. 2. An announcement of the topics will be mailed in advance upon request.

Radio Programs

"Calling All Gardeners" every Saturday morning from 8:30 to 8:45 over WNYC.

In the Conservatory

Permanent displays of tropical plants, 10 to 4:30 daily.

In the Museum

Watercolors of tropical flowers by Mrs. Charles Platt, through May.

Nature prints by Arthur Rushmore, done on hand-made paper by Harrison Elliott, accompanied by some 19th century subjects from the Garden's library, opening in June.

Outdoors

Azaleas and rhododendrons, lilacs, irises, then peonies, are among the outstanding late spring displays at the Garden. The Thompson Memorial Rock Garden will be colorful throughout May. Gates to the Rock Garden are open weekdays until 4:30; Sundays from 10 to 6. The grounds of the Botanical Garden are open daily until half an hour after sunset.

COMING IN JUNE

Rose-Growers' Day — *June* 10

In co-operation with the American Rose Society
An all-day program featured by top-notch speakers and a symposium
on selection, culture, and disease and pest control of roses.

TABLE OF CONTENTS

MAY 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription $1.50. Single copies 15 cents.

JOURNAL

of

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VOL. 49 MAY 1948 No. 581

Plant-Hunting in Nyasaland

And Botanical Notes on Some Other Parts of Africa

By L. J. Brass

I.

BY AIR TO NYASALAND

FLYING to Africa from New York for the start of the Vernay Nyasaland expedition in May 1946, our first sight of the continent was the desert coast of Rio de Oro, on the great western bulge of the continent. Utterly desolate and dead, as far as could be made out from the air, the yellow sand of the Sahara lay under a brassy haze with which it seemed to merge in the horizonless distance to the east. No evidence of life appeared until, far to the south, we passed two patches of hills tinged with the green of vegetation; then an oasis with green trees and cultivated land.

At Dakar, a fueling stop for our plane, the sparse vegetation, and its drought-resistant character, indicated a climate still severely dry. Stony, practically grassless ridges carried undersized baobab trees, scattered low shrubs such as a *Bauhinia* and thorny acacias, and a few hardy perennials and dried-up annuals. Each shrub and herb stood in a little pile of wind-blown dust which had collected about its base. A coating of the same reddish dust clung to the plants and softened the outlines of the airport buildings.

As we continued southeast, toward the Gulf of Guinea, the coastal strip provided a striking example of the response of plant life to gradually increasing rainfall. Parched savannas with sparse low tree growth changed to open, then denser savanna-woodlands studded with many palms. Strips of dark forest, fringing rivers and the coast, increased in width as rivers became more frequent. The now greener savanna-woodlands became broken by patches of closed forest as we flew on, at four miles a minute, under gathering clouds which gave an appropriate setting for the changing scene below.

The savanna, or grass-and-tree, type of vegetation, disappeared entirely before we reached the boundary between Sierra Leone and Liberia. The only grassy areas were clearly the result of shifting native cultivation in a country otherwise covered with forest. At first it was generally a pale green second growth forest, broken by many clearings recently burned and being made ready for crops, and by old grassy clearings and others being reclaimed by new successions of forest growths. Later, as we approached

THE VERNAY NYASALAND EXPEDITION

WHEN Arthur S. Vernay suggested that I should represent the New York Botanical Garden on his third expedition to Africa, Leonard J. Brass has written, "I was eager for the opportunity to see something of the flora of a continent which I had not previously visited."

For the Garden, this expedition meant an opportunity to obtain a nucleus for the African Herbarium which is a part of its plan for the future. Mr. Brass is a member of the staff of the Archbold Expeditions of the American Museum of Natural History. His earlier collecting trips have largely been in the Pacific, and his plants from the Archbold New Guinea expedition of 1933-34 are deposited at the New York Botanical Garden.

Describing the start of the recent African trip, Mr. Brass has explained further: "Mr Vernay, a Trustee of the American Museum of Natural History, and Dr. Harold E. Anthony, the Museum's Curator of Mammals, had organized an expedition to the British Protectorate of Nyasaland. Captain Guy C. Shortridge, Director of the King William's Town Museum, in South Africa, was to be one of the party.

"We three from the United States left New York by air on May 11, 1946. About the same time Captain Shortridge, with Nicholas Arend and Matthew Swarz, his two colored assistants, started their long train journey from the Cape. Our gear and supplies had been shipped three months before by boat to Beira, in Mozambique (Portuguese East Africa), thence by rail 350 miles to Blantyre, commercial center of Nyasaland. We were to meet in Blantyre on the 20th of the month.

"Besides herbarium specimens the Garden wished to have living plants and seeds. The American Museum desired, in addition to mammals, specimens of reptiles and amphibians, freshwater fishes, and insects. For drying plants we had kerosene stoves and, for this purpose and for packing specimens, over half-a-ton of paper supplies. For the living plants and seeds, which were to be sent to the Garden by air mail, there were peat moss for packing, pliofilm wrapping material, and the yellow-and-green quarantine labels which are issued to holders of plant introduction permits by the U. S. Department of Agriculture."

A brief report of the expedition, with some of its botanical findings, is given here and in the succeeding number of the Journal. Part I gives a picture of Africa from northwest to southeast, as it was seen on the journey to Nyasaland, principally from the air. Part II describes the collecting done on Mlanje mountain, and Part III gives a glimpse of the balance of the expedition, which was concluded in October 1946 in the lower valley of the Shire river at Chikwawa, first explored by David Livingstone in 1859 and little changed since then.

PATH, PLATEAU, AND CAMP FOR COLLECTING ON MLANJE

Top. Along the trail on Mlanje mountain, where forests of cypress fill the drainage areas in the grasslands. *Bottom.* Dr. Anthony's tent at Likubula base camp, under the western foot of Mlanje mountain.

SCENES FROM ZOMBA AND KASUNGU IN NYASALAND

(Described on the opposite page)

the Liberian capital of Monrovia through hard, squally showers, little evidence of human occupation could be seen in a vast dark mantle of primeval forest covering hilly terrain back from the coast. Near the shut-in airport were big American-owned plantations of Para rubber trees. The humid air was heavy with the "jungle smells" of burgeoning life and as rapid decay. We were in the luxuriant rain-forests of the equatorial region, in a biological other-world from the waterless desert wastes seen earlier in this same day's flight.

Passing over the Gulf of Guinea, and the equator during the night, we arrived early next morning at Leopoldville in the Belgian Congo. The summer rainy season had recently ended here in the lower part of the Middle-Congo basin, but the great river, fed by far-off sources, ran swollen and muddy between reedy or forest-fringed banks. Fishing canoes, each with two standing paddlers, were pushing out from thatched huts along the water's edge as the sun rose red over the river. Women were already at work in their cassava gardens back from the riverbanks. Since its introduction from the American tropics, probably by early Portuguese traders, cassava, or manioc (*Manihot esculenta*), has become a staple root crop over much of tropical Africa. We saw little else in the native gardens in this part of the Congo.

At Leopoldville we waited a week for a plane connection. The highlight of that interesting stay was a visit to the botanical garden of the Jesuit mission at Kisantu, some 70 miles south in the hills toward the border of Angola. The Jardin d'Essais du Frère Gillet, as it is now called, was founded in 1899 by the late Brother Justin Gillet, who in 46 years of devoted directorship saw grow around him a superb collection of ornamental and utilitarian plants, African as well as exotic. As I walked through Brother Gillet's mangosteen grove I thought of Dr. David Fairchild and his pioneer work which is now bringing this most delicious fruit of the East Indies to American tables.

Leopoldville's solid white buildings are designed for coolness. Like Brother Gillet's irrigated garden, its planted palms and shady trees give

SCENES FROM ZOMBA AND KASUNGU IN NYASALAND

The luxuriant growth of the rainy, foggy environment of Zomba contrasts strongly with the scrubby appearance of the plants which must combat the hot dry atmosphere of Kasungu. The white pompons at the upper right are flowerheads of a *Protea*, which is common as a shrub or small tree in the savanna-woodlands of Zomba mountain. Below is a scene in a native village at an altitude of about 3,000 feet near Zomba in the Shire highlands. The rocky hill in the background is covered with woodlands of the ubiquitous *Brachystegia*. Below at the left the small green rosettes of a *Crassula* are growing among mosses and lichens, partly shaded by grass. At the right is a view near Kasungu, nearly 400 miles to the north and west, where *Euphorbia ingens* was found in candelabrum form.

it a rich tropical appearance. But more truly indicative of the climate, a climate characterized by pronounced wet and dry seasons in the annual cycle, is the savanna of low trees and tall grasses which occupy most of the surrounding country.

Contrary to opinion rather widely held, the vegetation of the Congo basin is by no means all equatorial rain-forest. We had ample evidence of this on our 1,000-mile flight on to Elizabethville in the far southeastern corner of Belgian territory. In all this area, rising from 1,100 feet above sea level at Leopoldville to 2,000 feet at Luluabourg, halfway stop, and 4,050 feet at Elizabethville, but four large bodies of continuous rain-forest were seen. These were in strips along rivers in the first 500 miles; the broadest strip, about 25 miles wide, being on the Luebo tributary of the Congo.

For 800 miles on our course open savannas prevailed. Many small strips of rain-forest followed streams, and patches of rain-forest occurred on hilly areas of a country generally consisting of rolling ridges. In the last 300 miles of savanna, rain-forest vegetation persisted in diminishing "gallery" strips in the watercourses of a shallowly dissected, dryish-appearing, upland plain or plateau. Viewed from the air, a singular effect as of endless fields and hedgerows was produced here by a rectangular drainage system which cut the land into a checkerboard pattern of yellowish blocks of savanna, each block more or less completely surrounded by a dark line of gallery forest.

A striking change in vegetation took place near the little walled town of Kinda, about 230 miles from Elizabethville. There the thinly foliaged, rather shapeless trees of the savannas gave way to somewhat taller trees with rounded tops and darker and fuller leafage, growing in closer order on ground liberally pimpled with large termite mounds. We were on the edge of the *Brachystegia* woodlands, a savanna-woodland formation which spreads almost continent-wide over an immense expanse of elevated plateau lands south of the equator and north of the tropic of Capricorn. There was no longer any rain-forest even along the streamways. The disappearance of the gallery strips coincided with the change from savanna to savanna-woodland near Kinda.

We had been told something of Elizabethville, center of the rich copper mining area of Katanga. But I for one was hardly prepared to find in the very heart of Africa a busy European town with big hotels, shops featuring the latest styles from Brussels, and even an agency of Elizabeth Arden. Elizabethville is on an out-back railroad system on which one may travel from Cape Town to the navigable waters of the Congo, and coast-to-coast from Mozambique to Angola. Plantations of tall, greyish eucalypts looked much out of place in nature's local color scheme of warm browny-greens. The native vegetation was dense, shady savanna-woodland with trees about

30 feet high and a grassy ground cover. The numerous termite mounds, already mentioned as a feature of the savanna-woodlands, attained a height of 20 to 25 feet and were the largest we saw on the expedition. One great mound in a townsman's garden had a summerhouse perched on its top. Here, as in Nyasaland, the termite mounds carried trees and other plants quite different from those of the surrounding woodlands. A big columnar *Euphorbia* featured this mound flora, and mottled, sword-leaved sansevierias, so well known to growers of house plants, were common there.

To reach Blantyre we still had to do 1,200 miles of flying; south over the Rhodesias to Bulawayo, then northeast by way of Salisbury. A description of the plant cover, as seen from the air, would be largely an account of changing aspects of the savanna-woodlands, which became generally more open in character with the slow fall of the land from the Congo border toward the Zambezi, then denser again on the higher country of the flourishing European farming region of Southern Rhodesia. In much of Northern Rhodesia featureless plains stretched from horizon to horizon. A brownish haze obscured ground details and accentuated the essential sameness of the country. The winding Kafue River which we followed to near its junction with the Zambezi was bordered by open flats which broadened into a wide grass plain famous for its concentrations of big game. On its lower course the Kafue dropped into a deep gorge filled with dark forest—a refreshing sight after the drab monotony of the woodlands. The Zambezi, flowing through drier country than the Congo, carried no rain-forest on its banks at our Rhodesian crossing, or on its lower course where we crossed it again near Tete, 400 miles to the east in Portuguese territory.

Our introduction to Nyasaland was a brief but impressive lengthwise view of the straight deep trough of the Great Rift Valley, in which, away to the north, a hazy shimmer showed the position of Lake Nyasa. Then we swung in to the eastern rim of the Rift to land at Blantyre, 3,500 feet above sea level on the Shire* Highlands. Tea and sandwiches were served at the airport while the customs officer looked at passports. Thus, with a minimum of formality, we set foot on Nyasaland's friendly doorstep.

We had hoped for better conditions of visibility and a more extensive first view of the country in which we were to work. A bird's-eye view would have pointed up at once the exceptional advantages which Nyasaland holds for the biologist. For there in small space one finds all the major environments and types of vegetation seen on our flight over Africa, minus deserts and sea coasts, plus high mountains. It comes near to being a tropical Africa in miniature.

Nyasaland is a long, narrow country about 520 miles in length and but

* Pronounced with two syllables.

10 to 130 miles in width. The dominant central physiographic feature is the Great Rift, sunk several thousand feet between rimming plateau lands, and holding in our area Lake Nyasa, 350 miles long, and the Shire River by which the lake drains south to the Zambezi. Numerous mountain ranges and isolated peaks and hills rise steeply from the edges of the Rift or are set back on its flanking plateau highlands. The sweltering valley of the lower Shire lies less than 200 feet above sea level. Mlanje, the highest mountain, has an elevation of almost 10,000 feet and is subject to occasional snowfalls in the cool season. Annual rainfall ranges from about 25 inches on parts of the lowlands to over 100 inches on the mountains. It is this wide range of altitude and climate that provides conditions for Nyasaland's diversified flora and accompanying fauna. The flora is chiefly tropical, but plants of north and south Africa find a meeting ground at high elevations on the mountains.

We arrived in Blantyre at the beginning of the cool season which follows the end of the big summer rains. The climate was anything but tropical at that time of year. Mornings and evenings, one needed a coat for comfort. There were days of raw drizzle and mist called "chiparone," because of a native belief that such uncomfortable weather could only be a visitation from Mt. Chiparone, a solitary high peak over the Portuguese border. Cold climate annuals grew with tropical and subtropical trees and shrubs in this little outpost town. Never had I seen such brilliant poinsettias. Sweet peas and carnations decorated the hotel tables, and on the menu were excellent strawberries, all grown locally.

To reach the higher mountains which were our chief goal, we traveled long distances over seldom smooth dirt roads with a 1½ ton truck brought

MLANJE AND SOME OF ITS FLOWERS

Rising some 7,500 feet above the plain of nearly 2,500 feet elevation, Mlanje mountain is shown here as it appears in the distance from the west. The highest part of this mountain mass, 12 miles broad, is farther north, and is shrouded in clouds much of the time. Large sections of this mountain are sheer escarpment, with forests occurring only in ravines. Yet many attractive flowers were found by the expedition in the protected places of the mountainside and its plateaus. At the left is a succulent species of *Senecio* with peltate leaves and attractive yellow flowers, growing at an elevation of 8,000 feet. To the right is one of the characteristic aloes of the mountain, which grew by the thousand on the rocky heights at around 7,500 feet altitude, often bending its orange-red flower stalks away from the slope. The yellow everlasting (*Helichrysum*) shown in the center made colorful mass displays on the frosty grasslands of Luchenya plateau, at the top of Mlanje. Below at the right is another *Helichrysum*, whose silvery flowerheads are flushed with pink. This species grows only on the rocks of Mlanje mountain. At the left is another aloe commonly seen on Mlanje, framed by the lichen-covered boulders of the mountainside.

from the United States. District Commissioner C. W. Benson, well known amateur ornithologist, gave valuable assistance in finding us suitable native Africans for use as collecting boys and other helpers, including a head-man-interpreter. These cheerful, willing natives contributed much to the success of our trip. Riding through the country on a truck, seeing new scenes, visiting strange peoples, finding everywhere appreciative audiences to listen to tales of their doings with the "Americans," and being treated to sometimes over-liberal quantities of native beer, seemed to them a great and satisfying adventure which never palled.

In the order of our itinerary, plant collections were made from Zomba Mountain (7,000 ft.), Mlanje Mountain (9,843 ft.), Nchisi Mountain (5,400 ft.), Nyika Plateau (7,000 to over 8,000 ft.), Kasungu (3,400 ft.) on the western plateau lands, the Chia area (1,530 ft.) on the west shore of Lake Nyasa, Cholo Mountain (4,600 ft.), and Chikwawa (350 ft.) on the lower Shire River.

II.

COLLECTING ON MLANJE

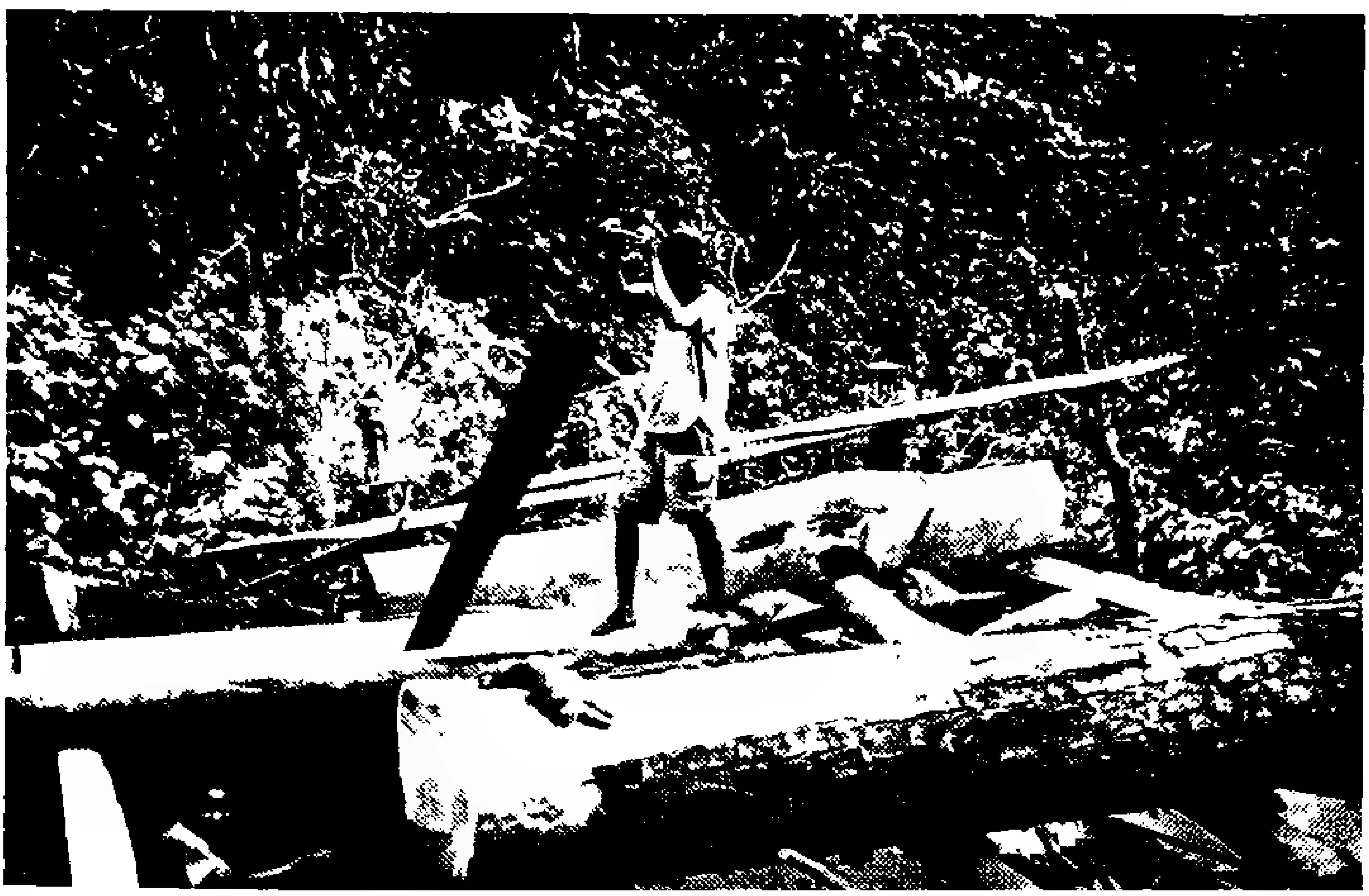
Because of its altitude and known zoological and botanical interest, Mlanje Mountain claimed early attention. It was reached in a picturesque 40-mile drive over the Shire Highlands from Blantyre, mainly through brachystegia woodlands. At Limbe, where we stopped to buy dried lake fish for our native helpers, the staple mealie meal (corn meal) and beans, and a variety of tropical and European vegetables were displayed in a busy native market. But in some other respects, Limbe looked decidedly un-African. Smoothly clipped, bright green hedges of cypress (*Cupressus lusitanica*) from the Mediterranean region surrounded the brick houses of European residents. Plantations of smooth-boled *Eucalyptus saligna,* native in Australia, made splendid growth on the deep red soil, and a patch of sweet gums (*Liquidambar styraciflua*), introduced there from North America, showed all red and yellow in their fall coloring; this in June, south of the equator.

Further on, *Raphia vinifcra,* one of Nyasaland's few palms, and of special interest in that it occurs on the Amazon as well as in tropical Africa, filled the wet hollows of streams. In the tea-growing district of Cholo, tall dark rain-forest grew in gullies in the woodlands and covered the top of Cholo Mountain. Looking out to the east over terraced tea plantations, as close cropped and almost as green as the cypresses of Limbe, we had a fine view of the forbidding, now adjacent blue bulk of Mlanje.

An isolated rectangular massif some 12 miles across, Mlanje rises precipitously from a base elevation of about 2,100 feet on the Shire Highlands. Some of its cliffs rise 6,000 feet in height; some form the outer edges of Luchenya, Chambe and other small plateaus that rest upon the flanks of the mountain at about 6,000- to 7,000-foot elevations. From the plateaus rise crowning ridges and peaks of which the highest, the central Mlanje Peak, has an altitude of 9,843 feet. The rock is syenite, akin to granite.

Through the courtesy of Mr. R. G. M. Willan, Conservator of Forests, we had for a main base here the use of a timber depot attractively situated in the mouth of the Likubula Gorge, under the western foot of the mountain. Issuing from the gorge was a swift, rocky stream with mossy banks shaded by lines of rain-forest trees. Several large sheds at the depot were stacked with fragrant piles of sawn Mlanje cypress, *Widdringtonia Whytei,* pit-sawn on the high plateaus and brought down to the depot by native carriers. This valuable timber tree, known only from Mlanje and one mountain in Southern Rhodesia, is named for Alexander Whyte, who made the first plant collections on Mlanje in 1891. Vigorous young seedlings of it are now growing under glass at the Garden.

There was no shortage of volunteers to carry our boxes and bundles when we were ready to do the 4,500-foot climb to Luchenya Plateau where a cottage, one of several on the plateau, had been offered by Mr. Willan for our use. Each man took a load of 40 or 50 pounds, steadied it on his head with one hand, and with the other hand grasped a bamboo staff to help him up the steep grades. Some of the carriers had iron-bladed spears



Mlanje cypress (*Widdringtonia Whytei*), the principal timber tree of Nyasaland, is hand-sawn with one man working the narrow end of the saw from a pit.

instead of plain sticks. There was a chance, they said, of meeting a leopard on the way. With a spear, they would also feel safer in the eerie mist which was pretty sure to be down on the mountain by the time they left us at our destination and started back for Likubula and their villages.

For the first hour we ascended steadily through brachystegia woodlands in which the big-leaved MSUKU tree (*Uapaca Kirkiana*), bearer of an edible fruit, was prominent. After another hour of hot climbing and edging around precipices by a path so steep in places that steps had been cut for footing, we stopped to photograph some aloes at 4,660 feet by aneroid. With the red and yellow aloes on a seepage-wet rock slope, a pretty white crassula was in flower, and close by, under a bluff, we found the first small cypress tree.

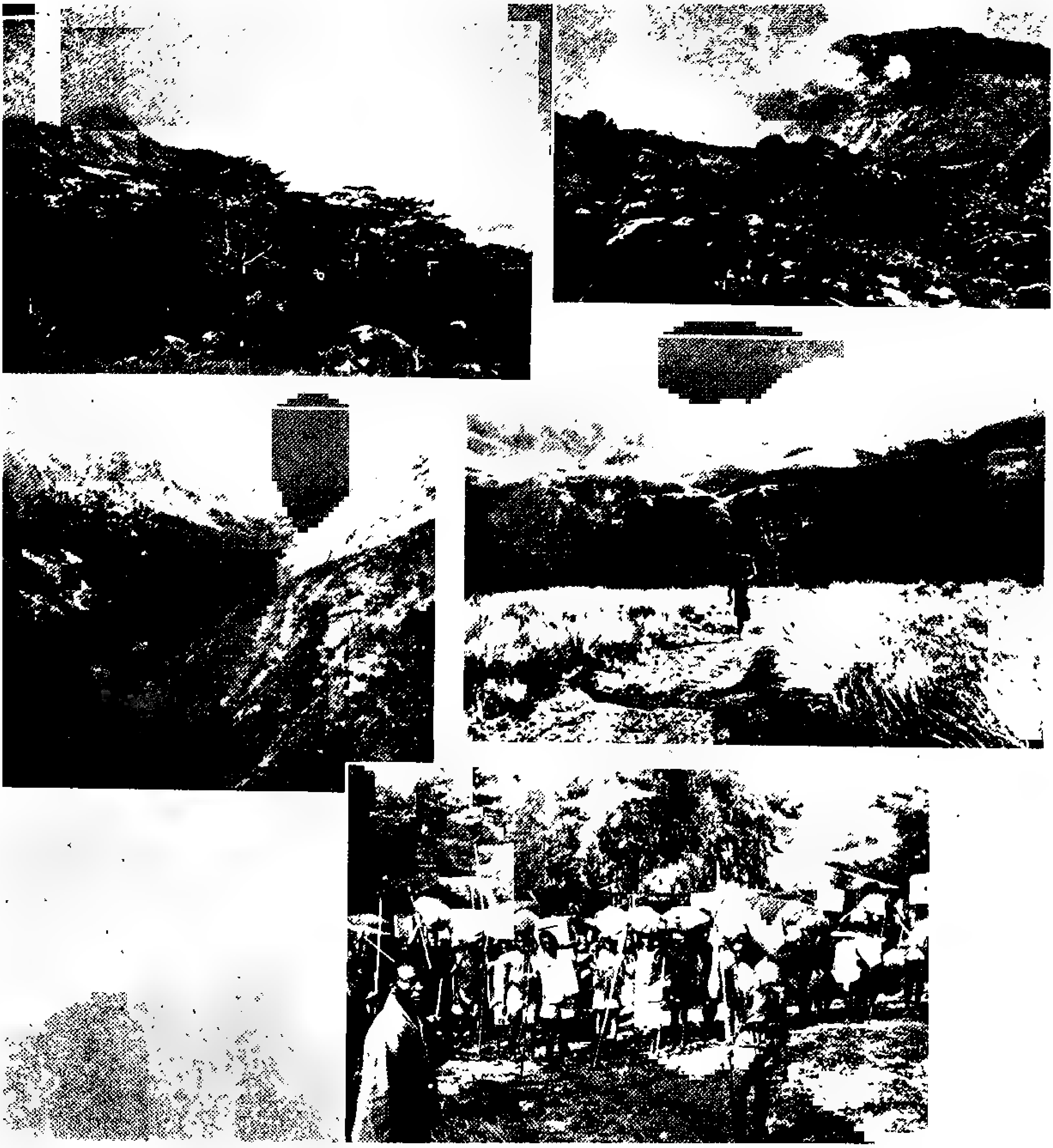
The last stunted brachystegias were left behind at 5,600 feet as we came to the lower edge of the cool uplands and an ecological association greatly different from anything below. This was an open woodland too, but the tall, coarse grasses of lower levels had given place to knee-high soft grasses. The low gnarly trees included a tree heath, *Philippia benguelensis,* and the big white pompons of a shrubby species of *Protea* showed above the grass.

With full plant presses we topped the climb at 6,850 feet, close under the weathered grey mass of the main peak. Sloping below us as we faced into a keen south wind soon numbing to bare hands and ears lately unaccustomed to cold, was the ridgy plateau of Luchenya.

The scene reminded me of some of the burnt-out highlands of New Guinea. Undulating ridges of frost-bitten grassland, smooth as cultivated fields; then in the gullies and a deep gorge, sharply defined bodies of forest almost blackish in the depth of their green. Fires undoubtedly had been at work. We know a part of the story from Whyte's and other early records. The rest must be surmised, for the writings on such parts of Nyasaland go back scarcely 50 years.

Accelerated by solar radiation, evaporation is rapid in clear weather on tropical mountains. In unusually dry or mist-free seasons, perhaps, the mossy forests of the plateau would be in condition to burn. Fires would creep up the mountain sides every dry season, sometimes reaching the plateau and eating into the forests. Natives driving their cattle to high pastures on the slopes, and perhaps to grasslands which must always have been available above timber line, would light fires which hastened the process of destruction. The forests had no chance to survive except in the sheltered moist places where, when we saw them in 1946, they were protected by Forest Department fire lines.

The Mlanje cypresses grow sometimes in pure stands, sometimes in scattered order, spreading their lichen-draped crowns far above the broad-leaved trees that form the canopy of the forest. Some of the cypresses looked very old, were over 100 feet tall, and their trunks, covered with fibrous bark 3 and 4 inches thick, were up to 6 feet in diameter. Asso-



ON AND AROUND LUCHENYA PLATEAU, AT THE TOP OF MLANJE MOUNTAIN

At the left are Mlanje cypresses on the slope southeast of Luchenya. Below it are remnants of rain-forest which have survived in gullies and gorges on the mountainside. This photograph, taken from Luchenya plateau, looking down, shows one of the best remaining examples on the Mlanje slopes. To the right is one of the main trails to Luchenya, and, above it, a view near the plateau itself. At the bottom the native carriers of the expedition are ready to leave Luchenya plateau and Mlanje mountain.

Of the photographs accompanying this article, the concluding portion of which will appear next month, about half were taken by the author, the remainder by Dr. Harold E. Anthony.

ciated trees included a second large conifer, *Podocarpus milanjianus,* and a rather limited number of smaller trees such as species of *Aphloia, Royena, Pygeum, Myrica* and a ray-leaved *Cussonia.*

Mosses and ferns were much in evidence on trees and on the ground. In the tree tops, mosses formed big cushions, decorated with various small ferns and orchids. In the moister ravines, mosses enveloped the tree trunks in a soft covering, beaded with moisture, and, spreading over surface roots and forest debris, they completely covered the ground in a treacherous carpet raised a foot or more above solid earth, concealing dangerous rock crevices. Delicate filmy ferns (Hymenophyllaceae), aspleniums, and cord-like lycopodiums hung from the mossy trees. Two fine species of tree-ferns (*Cyathea*) occurred on the banks of streams where a mauve *Impatiens* made patches of color on rock ledges, and the yellowish culms of a bamboo arched out over the water.

Most of the colorful winter-flowering plants of the mountain were concentrated either in dense woody growths that screened the forest edges, or on neighboring sheltered grasslands. It was pleasant to collect there even in chiparone weather, when the forests dripped water and one's activities in them were limited through inability to make out details in the tree tops or see more than a few yards along the ground. Brightest of all the forest border plants was *Hypericum lanceolatum,* growing to small-tree size and bearing a profusion of big yellow flowers. Robust *Impatiens shirensis,* 5 or 6 feet high, had white or pinkish flowers. *Dissotis* and *Tephrosia* supplied tints and shades of purple. The small lilac flowers of a *Buddleia* gave off their perfume. Yellow everlastings (*Helichrysum*) were massed on sheltered grasslands, and in such places were found *Erica Johnstoniana,* with nodding heads of pink flowers, and several more of the eight species of heaths which were collected on Mlanje.

Clear days were chosen for long excursions over the plateaus and to the high ridges of the mountain. The rolling grasslands of Luchenya Plateau cover deep deposits of a bauxitic clay which, on exposure, oxidizes into a rough pebbly surface that crunches under one's feet like clinkers. The grasses had dropped their seeds; a common *Gladiolus* was past flowering.

Above the plateau, and most of the forest, at about 6,500 feet on the slopes, one came to rough tussocky grasslands broken by rocky crags and smooth faces of bare rock. Breaking trail through the tussock grasses was hard going, and would have been more difficult but for the runways of small mammals which made for easy travel when they went in the right direction. It was easy, too, to drop into deep gutters eroded in the blackish organic soil and hidden under the grass. Bulbous and cormous plants became rather prominent here, among them a delicate pink *Dierama,* and a red-hot-poker plant (*Kniphofia*) from whose leaf-fibers the natives make very strong cordage.

A rock-inhabiting plant, to me the most beautiful plant on the mountain, grew at these altitudes. This was a bushy *Helichrysum* with silvery white flowerheads most delicately flushed with pink. Like several other showy composites, it was just beginning to open its flowers in mid-July. Another characteristic rock plant was *Vellozia splendens*. We did not see the magnificent white flower clusters which inspired the name of this "tree lily." It flowers in spring. But our natives, knowing the value of its fibrous stems for scrubbing brushes and for scouring cooking pots, were thoughtful enough to cut stalks for the wives they had left behind in their villages.

For a description of conditions on one of the high ridges of the mountain, I will quote from my diary for a day on which I climbed to an altitude of 8,000 feet with my helpers Tambula and Mateyu.

"A piercing wind, whipping across the top of the ridge, shook and bent the dwarf trees that grew amongst the rocks, and to fortify my shivering boys, I issued them a chocolate bar apiece. In the saddle in which we stood, the crest of the ridge was a jumble of great rocks, weathered and cracked and piled one upon another. Heightening the grotesque effect of the elfin wood of wind-clipped little trees growing packed against the rocks and in cracks between them, was an aloe, perched on top of the rocks, its leaves curved like crooked spokes of a wheel, and its spikes of bright red flowers leaning over at an angle."

A wiry plant of the Restionaceae grew with grasses in the broader spaces. The Mlanje cypress also occurred here, but in a dwarf form of shrub habit, with larger cones than the tree form found in the forests of the lower levels.

Plants of unusual interest turned up every day of our three weeks' stay on Mlanje. The last plant I collected there was one I had sought from the beginning. Walking ahead of the carrier line as we left the mountain to return to Likubula, I noticed some fresh white flowers in a patch of bracken which had been burned by forest guards a month before. The plant was *Anemone Whytei,* the only member of the genus known from that part of Africa. I had found only sterile plants elsewhere, always growing under bracken. Like many grassland herbs of the region, it seemed to need the stimulus of fire to stir it into reproductive activity.

On the Cover

THE largest area of forest surviving on the western part of Mlanje mountain is to the southeast of Luchenya Plateau, where gullies and a deep gorge afford protection from fire, and the first clouds of the day strike the mountain in the dry season. When this photograph was made, toward noon in June, a cloud mass was approaching on the prevailing southeast wind. In the right foreground are lichen-draped Mlanje cypresses.

Bacteria Which Make Their Own Light

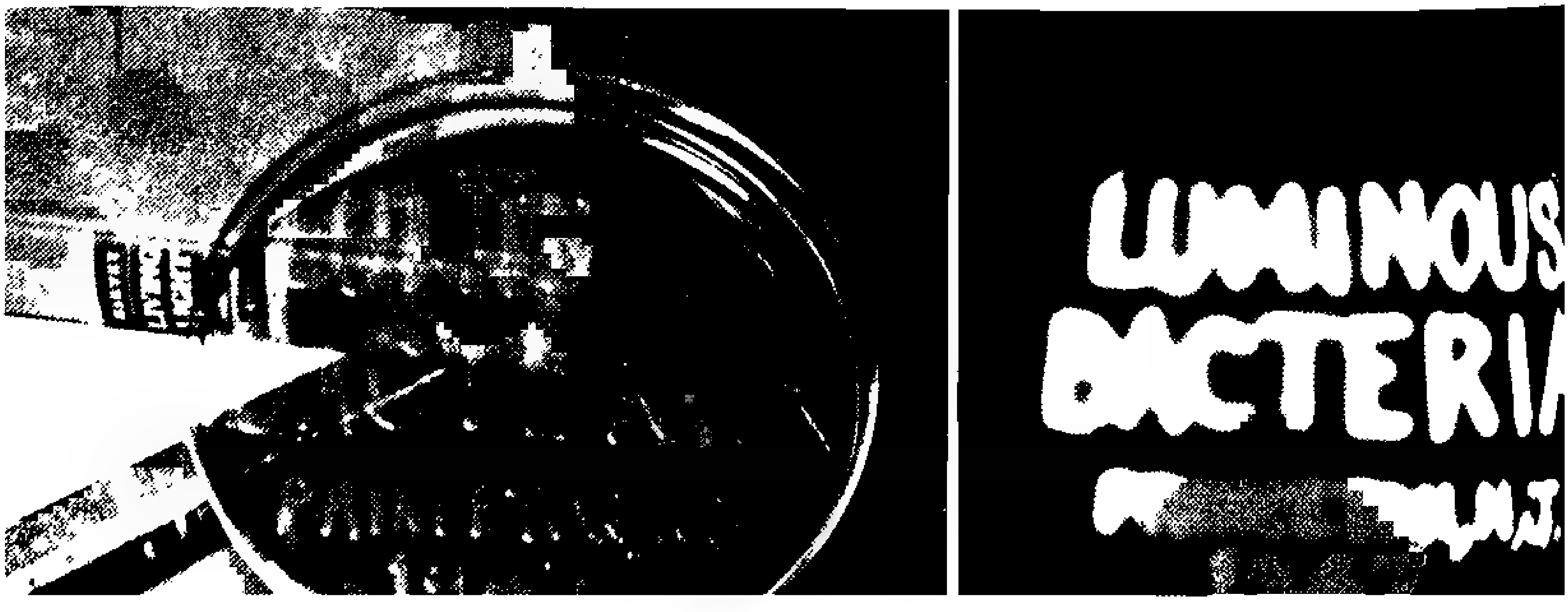
By Frank H. Johnson and Henry Eyring

AMONG all the phenomena exhibited by living organisms, luminescence, or the production of "cold light," is certainly one of the most remarkable. The firefly, emitting little flashes of greenish-yellow light late in summer evenings excites the interest and curiosity of children and adults alike, while the steady luminescence of its larva, the glow-worm, has lent inspiration to poets (Shakespeare, Hamlet, Act I, Scene V), musicians (Paul Lincke, "The Glow-Worm"), and scientists (Robert Boyle, and many afterwards). To the average layman, the light of the firefly is fantastic, all the more since it appears to be unique, or at most extremely rare, in the living world.

Luminescence of decaying wood, caused by fungi, and luminescence of certain fungi themselves, such as the jack-o'-lantern fungus, *Clytocybe illudens,* are less frequently observed, though both these phenomena are fairly common and were known to philosophers as long ago as Aristotle. This is no doubt because even the most ardent devotees of natural history seldom make field trips into the woods on dark nights. Even less familiar, in these days of modern refrigeration, is the luminescence of dead fish and meat, which is invariably caused by certain species of bacteria. A few generations ago it was often noticed by both the housewife and butcher. Under the microscope, the luminescent slime on a dead fish is found to consist of an enormous number of single-celled organisms, each not more than about 1/25,000 of an inch long, and slightly less in width. Their

LUMINOUS LETTERING WITH BACTERIA

A sterilized camel's hair brush was dipped into a suspension of living bacteria of one of the luminous species (Photobacterium phosphoreum). The letters were formed by drawing the brush gently over the surface of a nutrient gelatin medium in a petri dish. The bacteria grew rapidly along the lines where the brush touched the medium. Within a few days it was possible to see the letters clearly, as shown on the left. In darkness, as at the right, the lettering stood out brilliantly by its own light-giving power.



About the Authors and Their Work

THE authors of this article are prominent among the workers in bioluminescence, a subject which has recently come under observation also in the New York Botanical Garden's laboratories. Dr. Johnson, who is in the Department of Biology at Princeton University, is the author of the chapter on Bacterial Luminescence in Volume 7 of "Advances in Enzymology" (1947).

"Living Light," a book by Professor E. N. Harvey, also of Princeton, published by the Princeton University Press in 1940, deals with the general subject of bioluminescence, including both animal and plant life, as well as physico-chemical aspects.

With Dr. Eyring, who is now Dean of the Graduate School at the University of Utah, and others, Dr. Johnson has published numerous technical papers on bioluminescence.

Dr. Frederick Kavanagh, Associate Curator at the New York Botanical Garden, is the author of "Antiluminescent Activity of Antibacterial Substances," published in the September-October issue of the Bulletin of the Torrey Botanical Club in 1947.

structure is so simple that even the electron microscope, magnifying by thousands of diameters, reveals little more than a seemingly undifferentiated, minute body of protoplasm, surrounded by a cell wall of some sort and in some species numerous delicate strands, or flagella, which are generally thought to be structures which enable the organism to swim about in water.

In point of fact, however, bioluminescence is a widespread phenomenon, if we take into account the multitude of luminous organisms in the sea. Almost all the chief groups of marine organisms, from the simple bacteria and protozoa to fish, include some members that produce cold light. Luminous bacteria are extensively distributed in sea water, although they are never found so abundantly as to cause luminescence of the water, unless they are in an unusual concentration, as when growing upon some other, usually dead, organism. The luminescence that occurs in the wakes of ships, or that sometimes appears when the water is agitated by other means, results not from bacteria but from protozoa, jelly-fish, and other small animals which emit light in response to mechanical and other stimuli.

Luminous bacteria may be readily obtained in pure culture, by ordinary bacteriological methods, from luminous dead fish or meat. Nearly all marine fish from markets will develop luminescent colonies of these organisms, and can be induced to become luminous all over before putrefaction sets in, if placed in a dish in such a manner that they are partially immersed in a solution of 3 parts of common table salt to 100 parts of water, and then left for two or three days in a refrigerator.

But aside from sheer fascination, and the academic interest or inquiry that is inevitably aroused by such an extraordinary phenomenon, why study luminescence in our scientific laboratories? The answer is simple. It is because luminescence is a tool, so to speak, of unparalleled efficiency, for the investigation of biological problems of fundamental importance. There is no other biological reaction in nature which has a natural indicator of its own velocity that is so instantaneous and so easily and accurately measurable.

Bioluminescence is an oxidative reaction in which part of the energy of the reaction is dissipated in the form of visible light instead of heat. The brightness of the light faithfully indicates the speed of the reaction, just as the brightness of an electric light depends upon the speed of the dynamo generating the current. In bioluminescence, a protein catalyst, or enzyme, known as LUCIFERASE, accelerates the oxidation of a substance known as LUCIFERIN, and the amount of light is proportional to the speed of this oxidation. Consequently, by measuring the influence on luminescence of various factors, such as change in temperature, acidity or alkalinity, or the addition of drugs, it is possible to learn quantitatively how the functioning of this system is affected at any moment.

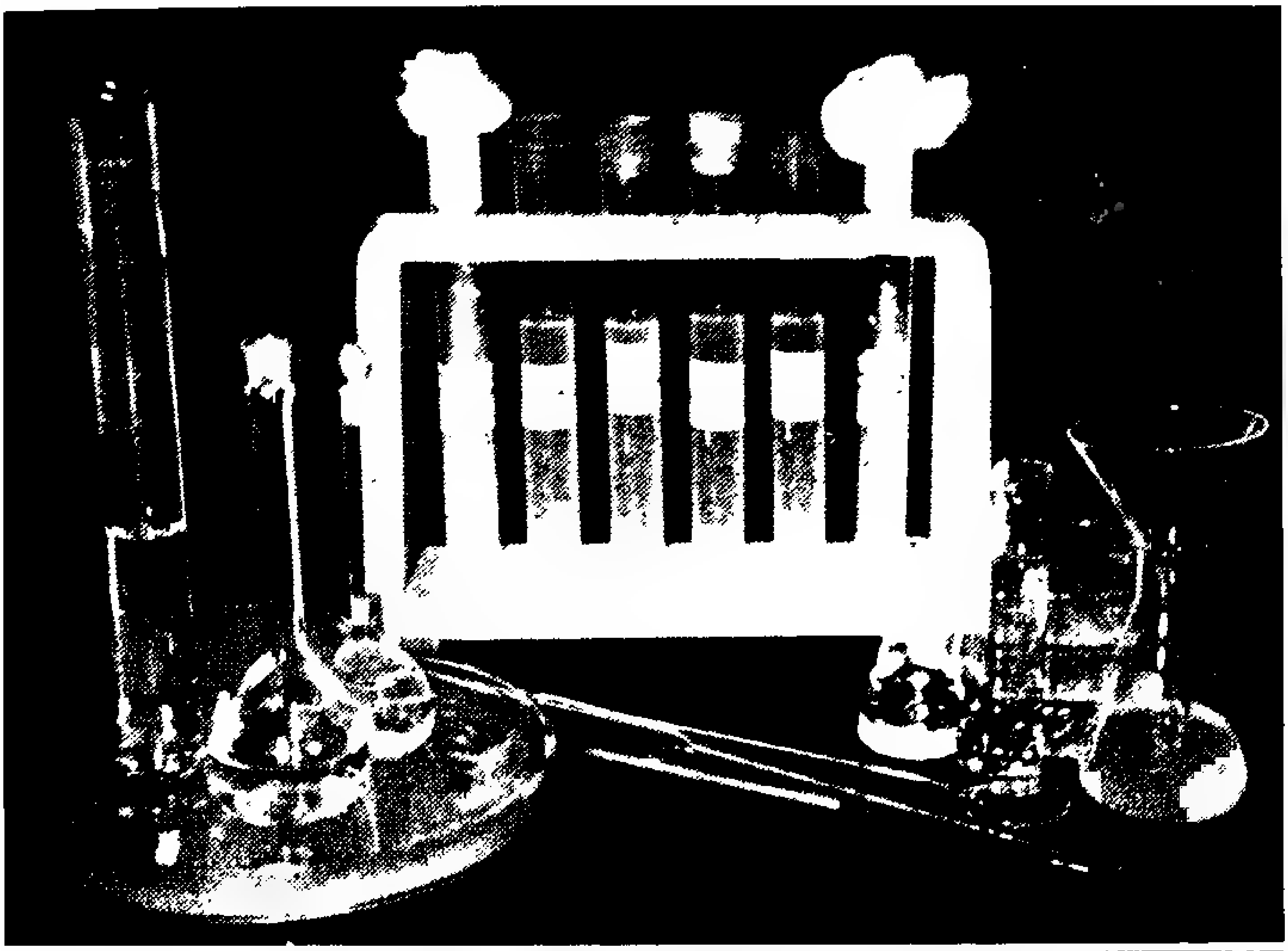
Thus, recent studies have shown that when a solution of sulfanilamide is added to a suspension of luminous bacteria, the brightness of the light immediately decreases. If a large amount is added, the light is extinguished. Furthermore, some of the naturally occurring antibiotic compounds, such as aspergillic acid, affect luminescence, and their potency may be assayed by this means. Various narcotics — alcohol, ether, urethanes, novocaine and others—also affect luminescence. Heat and cold, as well as purely hydrostatic pressures (of several hundred pounds per square inch) profoundly influence the brightness of luminescence,

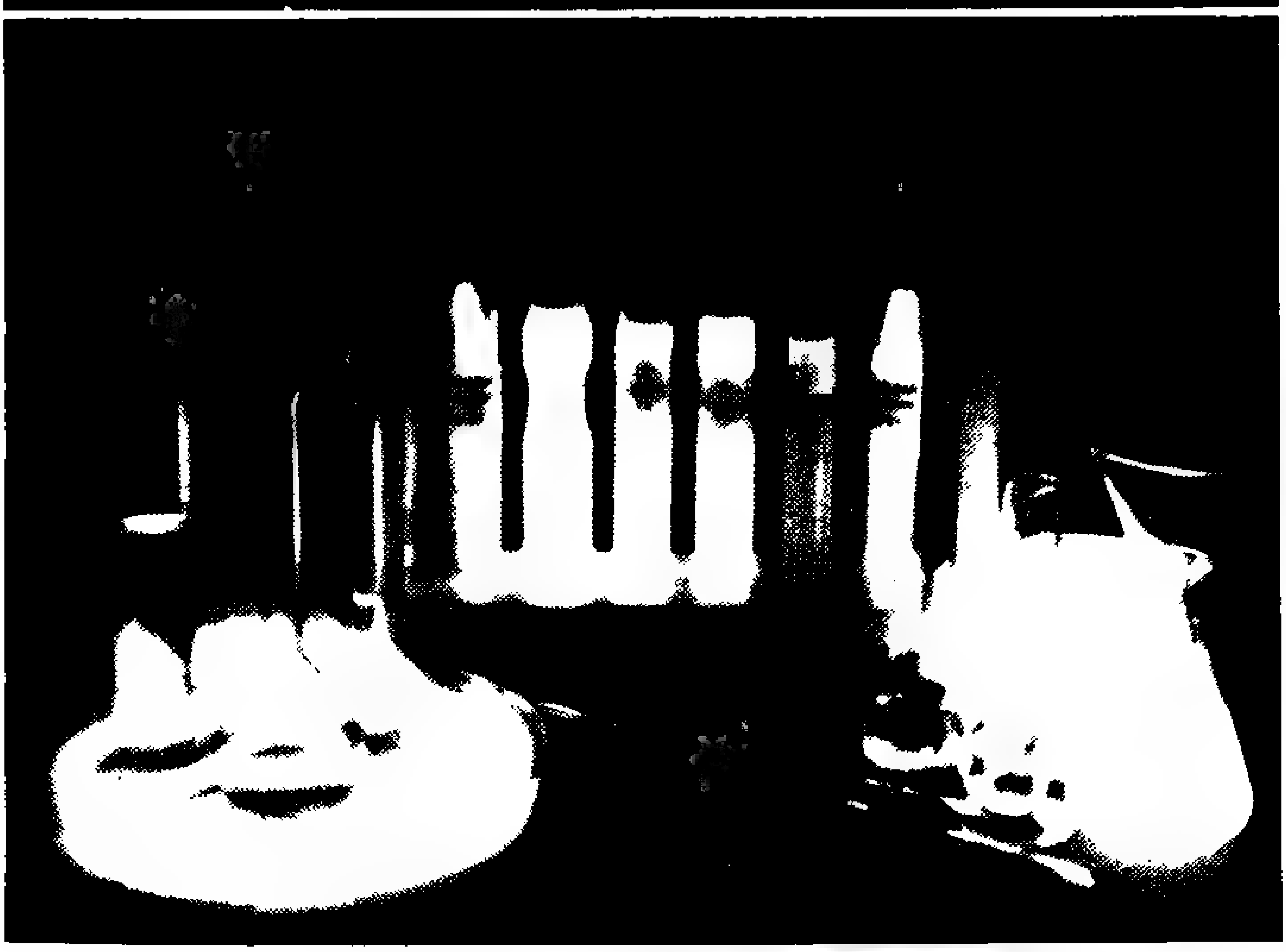
AN EXPERIMENT WITH LUMINOUS BACTERIA

(Illustrated on the opposite page)

Around the rack containing the six test tubes are grouped some cultures and equipment. In the first and sixth tubes, from left to right, are growing cultures of *Photobacterium phosphoreum* on the surface of a nutrient agar medium. The other four tubes each contain about 50 billion individual bacteria suspended in a neutral salt solution. Tube 2 is a normal suspension; tube 3, a corresponding suspension to which was added a very small amount of sulfanilimide; tube 4, a few drops of alcohol; and tube 5, a few drops of ether. The brightness of the luminescence in tubes 3, 4, and 5 immediately decreased when the drugs were added, but it was found that the brightness would return to normal if the drugs were washed out of the specimens. The upper photograph was made by ordinary illumination, while the lower one had only the light furnished by the bacteria themselves.

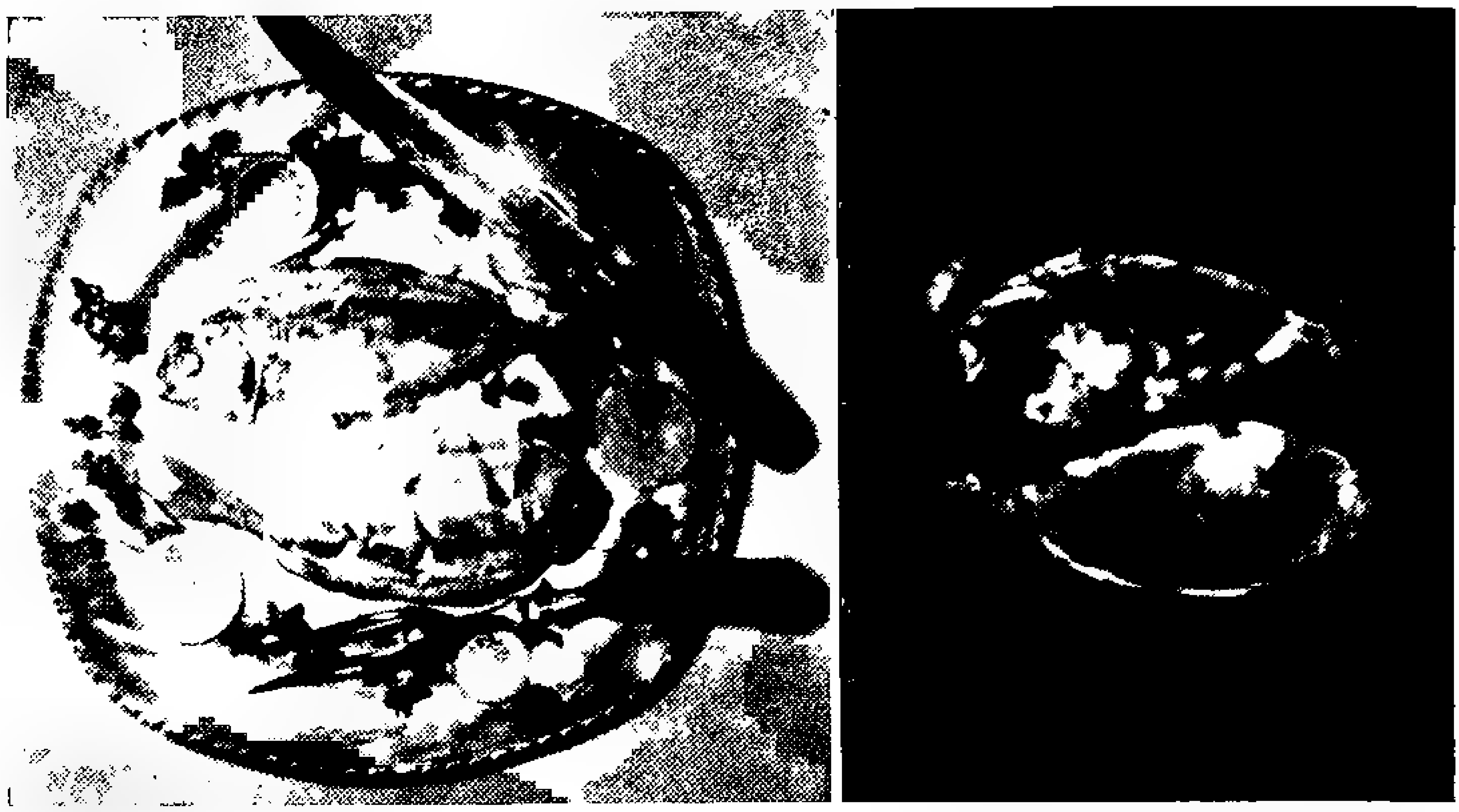
These bacteria are so minute that, if placed side by side in a row, 30,000 of them would make a line only 1 inch long. They are one-celled organisms which reproduce by increasing in size and then dividing into two young, single-celled offspring, each similar to the parent.





AN EXPERIMENT WITH LUMINOUS BACTERIA

(For explanation, see the opposite page)



FISH FOR DINNER? NOT TODAY!

This inviting dish actually had an appetizing odor and, when viewed by ordinary light, appeared entirely edible. But when seen in the dark, as shown in the photograph on the right, it glowed with the eerie bluish luminescence emitted by myriads of bacteria growing upon the surface of the fish. No other source of light was used to make this photograph. The fish were first steamed, then inoculated with a pure culture of Photobacterium splendidum, which in the course of a day or two at room temperature grew enough to nearly cover the fish.

as well as the action of drugs which affect this enzyme system. Moreover, the effects of different types of drugs are influenced in different manners by changes in temperature or pressure.

Until as recently as 1935 it would not have been possible to analyze the action of these several influences, separately or in combination, in relation to a rational chemical theory. In 1935, however, with the introduction of the Theory of Absolute Reaction Rates, a fundamental basis for the rational interpretation of chemical reaction rates became available. This theory, applicable to all chemical reactions, represents the culmination of many years of theoretical research by chemists and physicists, and through a single equation bridges a gap between our most modern concepts in these fields of science. It is noteworthy that when, in 1942, the theory found its first application to living cells, it was with reference to bacterial luminescence. As a result, a clearer, more precise understanding has been achieved with regard to the intimate mechanism through which temperature, pressure and drugs influence biological reaction rates generally. Ultimately, all biological processes, however complex, must be interpreted in terms of chemical reactions. The luminescent enzyme system shares many fundamental characteristics of other systems in plant and animal bodies, such as those controlling growth, respiration, digestion, synthesis, and others. It is now possible to predict quantitatively, and fairly accurately, how the intensity of luminescence will change in response to various changes in the environmental conditions. Moreover, some of the results which would be anticipated in general, on the basis of the behavior of the luminescent system, have already been observed in totally different material, including blood proteins, antitoxins, and viruses, under the influence of temperature, pressure, and drugs. It is reasonable to expect, therefore that studies of bacterial luminescence—originally begun through sheer academic interest—will provide a basis for the understanding of fundamental biological problems of the utmost practical as well as theoretical interest.

NOTICES AND REVIEWS OF RECENT BOOKS

Growth-Promoting Substances Described for Layman and Student

HORMONES AND HORTICULTURE. George S. Avery, Jr., and others. 326 pages, illustrated, indexed. McGraw-Hill, New York, 1948. $4.50.

"Hormones and Horticulture" was written by four well-recognized botanists. In an effort, however, to present factual material, the authors had eight of the eleven chapters critically reviewed by leaders in the various fields. Though the contributors admit that they are not horticulturists, the senior author has been a leader in hormone research in the United States and also has kept close watch of practical applications resulting from laboratory work.

The title of the book interested the reviewer. The term "hormone" used for synthetic physiologically-active substances is somewhat of a departure for the scientist, but a departure of which the reviewer approves. Popular usage by laymen and scientists has led us to accept the term "hormone" to take the place of "auxin," "growth substance," and other less popular designations. It doesn't appear to matter whether the chemicals are natural or synthetic; the word "hormone" has a popular appeal and serves a good purpose.

Five chapters of the book deal strictly with practical applications and developments from hormone research. The subjects covered are root-inducing chemicals, parthenocarpy, hormone control of preharvest drop of fruit, inhibition of growth, and weed control. Valuable directions for both students and laymen are given.

One chapter concerns thinning fruit involving hormones and other chemicals used for practical purposes. The last chapter deals with the use of colchicine and other chemicals which produce polyploid plants and consequently new varieties.

While this book covers practically all of the uses of plant hormones for horticultural practice, it also gives the main facts and points of interest for students and laymen on historical phases of the subject. The authors give credit to leaders in the different fields of plant hormone research. In an attempt to record the results of many workers, the authors listed 142 references and used 73 pages of tables on the use of root-inducing substances for treating cuttings. While these citations will be good for students, they appear to have very little practical use. The use of hormones for treating cuttings has settled down principally to the use of indolebutyric and naphthaleneacetic acids. In a few cases substituted phenoxy acids have been found

useful, but at the present time they are not used in commercial preparations. From a practical point of view this chapter could be boiled down to a few pages.

The reviewer finds this book well illustrated, well written, and it should be interesting to the average reader as well as to those who wish to make practical applications.

P. W. ZIMMERMAN,
Boyce Thompson Institute For Plant Research, Inc.

Bacteria and Man

INTIMATE BACTERIOLOGY: A Text and Laboratory Manual. Casper I. Nelson. 216 pages, illustrated. Burgess Publishing Co., Minneapolis. Revised edition, 1946. $3.

This book gives a good illustration of the relationship of bacteria to man from the very beginning of the individual's existence to old age and death. Furthermore, it illuminates most of the intimate processes going on in the human body and explains the chemical action of bacteria on food.

As the author states in his introduction, the book is for students who have a general knowledge of microbiology and who would like to learn just a little more with special regard to application to himself.

Pages 1-166 hold the theoretical section, pages 167-216 contain the laboratory exercises. The theoretical section is divided into three parts of twenty-five chapters. Part I deals mainly with relation of bacteria to food, water and the alimentary tract; Part II with relation of bacteria to respiratory tract, skin and hair; Part III with immunity, toxins and vaccines.

The book is rather interesting and the reader never gets weary of it.

HASSAN M. YOUSEF.

On Birds and Their Habits

HOW TO ATTRACT THE BIRDS. Robert S. Lemmon. 126 pages, illustrated, indexed. Doubleday, New York, 1947. $1.50.

Throughout this past winter many people have had ample chance to realize how much it means to study and feed the birds. Perhaps this realization will arouse questions. How do birds live?—feed?—nest?—and migrate? In his recently published book, "How to Attract the Birds," Robert S. Lemmon answers all these in a way interesting and helpful. Perhaps the chapters "Birds' Nests and Their Making" and "The Story of Bird Migration" are outstanding in their amount of information in concise form.

Mr. Lemmon's prose is admirably augmented by the line drawings of Roger T. Peterson, Tabea Hofmann, and Henry B. Aul, combining to make a "must" for every shelf holding books on outdoor life.

HENRY TUBBS,
Gladstone, N. J.

Flower Arranging For All

THE COMPLETE BOOK OF FLOWER ARRANGEMENT. F. F. Rockwell and Esther C. Grayson. 308 pages, illustrated in color and black and white, indexed. Doubleday, Garden City, N. Y. 1947. $4.95.

"Complete" indeed. This excellent and beautiful text book on the lively art of flower arrangement gives the experienced arranger everything needful; but, what is more important, it makes just the right approach for the beginner. It is good psychology to explain first of all how design makes an "arrangement" more interesting than a bouquet.

Color comes early in the book too, and not as frightening theories standing alone, but made a part of design. Full-color reproductions of arrangements by well-known artists illustrate the various harmonies.

There are also several chapters on problems of flower arrangement in which the experts share their "know-how."

GRACE COYLE,
Douglaston, N. Y.

Notes, News, and Comment

New Edition. "Diseases and Pests of Ornamental Plants" by B. O. Dodge and H. W. Rickett, first published by the Science Press in 1943, reappeared April 19 in a revised edition under the imprint of the Ronald Press Co. of New York. In the new edition the methods of control of diseases and pests have been brought up to date "whenever it was clear that the new discoveries made such changes desirable." While the work contains the technical names of plants and of their enemies, to meet the scientists' requirements, the treatment of the subject is such that the book can be used by any gardener with little or no technical training. In preparing the revision, suggestions and criticisms from colleagues have been given consideration, and the authors have had special assistance from P. P. Pirone, Dr. Dodge's successor on the Garden's staff, and Brayton Eddy, Curator of Insects at the New York Zoological Society. The new volume will be reviewed in this Journal. The price of the book has been reduced to $6.

Paintings. More than two dozen life-size watercolors, mostly of tropical flowers in Hawaii, Guatemala, and other warm-climate regions, are included in the current exhibit of paintings by Mrs. Charles Platt of Philadelphia, in the rotunda of the Garden's Museum Building. Among them are three of the large trumpet-flowers of the tropics — the cup-of-gold (*Solandra nitida*), the herald's trumpet (*Beaumontia grandiflora*), and the angel's trumpet (*Datura arborea*). Other spectacular flowers in the exhibit include the golden-shower tree (*Cassia fistula*), the potato-vine (*Solanum Wendlandii*), and the jacaranda (*J. acutifolia*). The exhibit will continue through May.

Conference. At the monthly conference of the staff and students of the Garden April 22, Dr. P. P. Pirone spoke on "Some Recent Research on Experimental Poliomyelitis." A paper by Dr. Pirone and others, entitled "Can *Drosophila* Carry Poliomyelitis Virus?" recently appeared in the Journal of Infectious Diseases (September-October 1947). The research reported in this paper represents the most elaborate fruit-fly experiments ever carried out. Since *Drosophila* is common at the time of year when infantile paralysis occurs most frequently, suspicion had been directed at the familiar fruit-fly as a possible carrier of the disease. The experiments, which were carried on at City Hospital, Cleveland, under the direction of Dr. John A. Toomey, Professor of Pediatrics at Western Reserve University, have proved, according to Dr. Pirone, that *Drosophila* is not a vector for poliomyelitis.

90th Birthday. Dr. L. H. Bailey of Ithaca, N. Y., known as the Dean of American horticulturists, was honored April 29 at a dinner given by Cornell University in recognition of his 90th birthday. His actual birthday, March 15, he spent alone on a collecting trip in the West Indies. Upon his return with a large assortment of palm specimens for the Bailey Hortorium at Ithaca, he announced plans for a future collecting trip in Africa. Dr. Bailey is a member of the Corporation of the Botanical Garden, and was on the Board of Managers from 1934 to 1938.

Dr. H. A. Gleason attended the birthday celebration as President of the Botanical Society of America and also represented the Botanical Gardens there.

THE NEW YORK BOTANICAL GARDEN

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue surface car to Bedford Park Boulevard

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs. Elon Huntington Hooker, First Vice-Chairman; Mrs. Richard de Wolfe Brixey, Second Vice-Chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Guthrie Shaw, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

Arthur M. Anderson
Mrs. Arthur M. Anderson
Mrs. George Arents, Jr.
George Arents, Jr.
E. C. Auchter
Mrs. Elliott Averett
Dr. Raymond F. Bacon
Prof. L. H. Bailey
Stephen Baker
Sherman Baldwin
Charles W. Ballard
William Felton Barrett
Mrs. William Felton Barrett
Howard Bayne
Edwin De T. Bechtel
William B. Bell
Prof. Charles P. Berkey
Prof. Marston T. Bogert
Prof. William J. Bonisteel
Mrs. James Cox Brady
George P. Brett
Mrs. Richard de Wolfe Brixey
Leonard J. Buck
Mrs. Charles Burlingham
Miss Mabel Choate
Miss E. Mabel Clark
W. R. Coe
Mrs. Jerome W. Coombs
Mrs. Henry S. Fenimore Cooper
Mrs. William Redmond Cross
Mrs. C. I. DeBevoise
Mrs. Thomas M. Debevoise
Mrs. Sidney G. de Kay
Edward C. Delafield
Mrs. John Ross Delafield
Julian F. Detmer
Mrs. Charles D. Dickey
Mrs. Charles Doscher
Mrs. Walter Douglas
Mrs. John W. Draper
Henry F. du Pont
Mrs. Moses W. Faitoute
William B. O. Field
Mrs. Robert H. Fife
Mrs. Reginald Fincke
Harry Harkness Flagler
Mrs. Mortimer J. Fox
Childs Frick
Rev. Robert I. Gannon, S.J.
Dr. H. A. Gleason
Mrs. Frederick A. Godley
Charles B. Harding
Mrs. Montgomery Hare
Mrs. William F. Hencken
Mrs. A. Barton Hepburn
Mrs. Elon H. Hooker
Mrs. Clement Houghton
Mrs. Roy A. Hunt
Archer M. Huntington
Mrs. O'Donnell Iselin
Pierre Jay
Mrs. Walter Jennings
Mrs. Alfred G. Kay
Mrs. F. Leonard Kellogg
Mrs. Warren Kinney
Mrs. Lee Krauss
H. R. Kunhardt, Jr.
Mrs. Albert D. Lasker
Mrs. Barent Lefferts
Clarence McK. Lewis
Mrs. William A. Lockwood
Dr. D. T. MacDougal
Mrs. James C. Mackenzie
Mrs. David Ives Mackie
Parker McCollester
Miss Mildred McCormick
Louis E. McFadden
Dr. E. D. Merrill
John L. Merrill
Roswell Miller, Jr.
S. P. Miller
George M. Moffett
H. de la Montagne
Col. Robert H. Montgomery
Mrs. Robert H. Montgomery
Barrington Moore
Mrs. William H. Moore
B. Y. Morrison
Frederick S. Moseley, Jr.
Mrs. Augustus G. Paine
Mrs. James R. Parsons
Rufus L. Patterson
Mrs. Wheeler H. Peckham
Mrs. George W. Perkins
Mrs. Hugh Peters
Howard Phipps
Rutherford Platt
Francis E. Powell, Jr.
Mrs. Harold I. Pratt
Mrs. Rodney Procter
Mrs. Joseph M. Proskauer
Mrs. Henry St. C. Putnam
Mrs. Grafton H. Pyne
Lady Ramsey
Stanley G. Ranger
Johnston L. Redmond
Prof. Marcus M. Rhoades
Mrs. Junius A. Richards
Dr. William J. Robbins
Mrs. Melvin E. Sawin
John M. Schiff
Mrs. Henry F. Schwarz
Mrs. Arthur Hoyt Scott
Mrs. Arthur H. Scribner
Mrs. Townsend Scudder
Mrs. Samuel Seabury
Mrs. Guthrie Shaw
Prof. Edmund W. Sinnott
Mrs. Samuel Sloan
Edgar B. Stern
Chauncey Stillman
Nathan Straus
Mrs. Theron G. Strong
Mrs. Arthur H. Sulzberger
Joseph R. Swan
Mrs. Joseph R. Swan
Mrs. Thomas D. Thacher
Mr. Oakleigh L. Thorne
Prof. Sam F. Trelease
Arthur S. Vernay
Mrs. Antonie P. Voislawsky
Manfred Wahl
Allen Wardwell
Nelson M. Wells
Alain C. White
Mrs. Nelson B. Williams
John C. Wister
Richardson Wright

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

Vol. 49
No. 582

JUNE
1948

PAGES
129-152

ROSE-GROWERS' DAY

at

THE NEW YORK BOTANICAL GARDEN

Thursday, June 10, 1948

Arranged in co-operation with the American Rose Society

Second District (New York State), *A. H. MacAndrews,* Chairman

MORNING PROGRAM

10:30 a.m.	*Informal Tour of the Rose Garden*	Under the leadership of L. C. *Bobbink* and his associates
11:30 a.m.	*Floribunda Roses*	*Fred Morley* Jackson & Perkins Co.
12:00 noon	*Roses for the Collector*	*Mrs. Richardson Wright*
12:30 p.m.	*Picnic Lunch*	(Each person bringing his own. A cold drink to be provided by the Garden.)

AFTERNOON PROGRAM

2:00 p.m.	*The Pursuit of the Rose*	*Edwin de T. Bechtel*
2:30 p.m.	*Symposium on Rose Problems*	Led by P. P. *Pirone* Plant Pathologist, New York Botanical Garden

The program and lunch will be outdoors in the vicinity of the Rose Garden if the weather is fair. If it should rain, the events will take place in the Museum Building.

Announcements being sent to members and others closely associated with the two organizations will serve as tickets of admission to the program.

TABLE OF CONTENTS

JUNE 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription $1.50. Single copies 15 cents.

JOURNAL

of

The New York Botanical Garden

Carol H. Woodward, Editor

Vol. 49 June 1948 No. 582

Plant-Hunting in Nyasaland

And Botanical Notes on Some Other Parts of Africa

By L. J. Brass

III.

PLATEAU, LAKESHORE, AND VALLEY IN NYASALAND

NYIKA Plateau, 350 miles to the north of Mlanje and on the opposite side of the Great Rift, carries a flora largely different from that of Mlanje. The plateau is roughly circular in shape and about 40 miles in greatest width. Its average elevation is about 7,000 feet. Scattered hills, smooth and rounded or crowned with rocks, rise in some places to over 8,000 feet. The largest and also the highest plateau in Nyasaland, Nyika is seldom visited now by Europeans; consequently very few plants had been collected there. It was necessary for me to visit it alone, with three field helpers and a cook, while Mr. Vernay, Dr. Anthony, and Captain Shortridge gave their attention to mammal collecting in the big-game country of Kasungu and the Chia.

My work on Nyika was aided by Major D. N. Smalley, Chief Agricultural Officer of the Northern Province, who allowed me to use the convenient Nchena-chena Experimental Station for a transport base, and lent me Native Agricultural Assistant Kachali as a go-between with the local headmen and as a guide on the plateau.

Nchena-chena is situated at about 4,200 feet altitude on the southeastern uplift of Nyika. One of the many perennial streams that descend from the plateau provides water to irrigate the thirsty red woodland soil. The purpose of the station is to demonstrate the feasibility of growing coffee, tung, and wheat in the area and to interest the natives in cultivating them as money crops. The idea of producing crops for sale, rather than just for food, has taken well in some other parts of the Protectorate, especially in regard to tobacco, cotton, and rice. Pyrethrum of good quality was grown experimentally on the Nyika uplands during World War II.

The climb up Nyika's steep slopes from Nchena-chena presented no

TWO CHARACTERISTIC TREES OF CHOLO MOUNTAIN

Top. A species of *Acacia* surrounding the expedition's camp at 4,000 feet on the south end of Cholo, near the edge of the rain-forest. *Bottom.* The trunk of a giant *Dracaena* in the rain-forest on the summit of Cholo mountain being surveyed by the author.

difficulty. In three hours, with laden carriers, I reached the plateau and established camp where two grass huts, built by the pyrethrum growers, offered shelter for my boys, and there was a bit of leveled ground on which I pitched my tent.

This was at an altitude of 7,700 feet on the edge of a boggy bottom surrounded by smooth grassy ridges in a landscape fairly typical of Nyika. Except for a few gnarled, lichenous and moss-grown relics on the edge of the bog, there was not a tree in sight. Firewood had to be carried half a mile from forests surviving under the scarped rim of the plateau. I say "surviving" forest because there can be little doubt that on the eastern part of the plateau, to which my observations were restricted, the present grassland condition has followed deforestation. Only scraps of forest, mostly in hollows, are left on this part of the plateau.

It is known that in the first half of the nineteenth century, before the coming of the white man, marauding hordes of the Angoni, a branch of the Zulu tribe, overran the neighboring lower country and drove the less warlike Apoka people to take refuge on Nyika. The Apoka lived there for a time. A small population on the southwestern part of the plateau, now known locally as the Nyika, are the descendants of a group of Apoka who remained on the plateau when the rest of the tribe returned to their homelands. The shy Apoka travel widely over the plateau. They trade tobacco and honey at Nchena-chena and as far as the shore of Lake Nyasa. And wherever they go they fire the grass. We do not know to what extent the destruction of the forests which must formerly have covered most of the plateau can be laid to the Apoka and their descendants. By clearing land for cultivation and by burning, they must at least have contributed to the process.

The rocky, dry-looking hills perhaps supported a limited grassland flora when the plateau was largely a great forest. The wet, boggy bottoms of hollows were undoubtedly an "original" habitat for grasses and associated plants. A view of the present grassland flora suggests stocking in part from the higher rocky hills and the wet streamways, with some contributions from forest edge communities, and certainly some from the brachystegia woodlands of lower altitudes.

By a fortunate decision to go while the going was good, I was able to see, about four hours' walk over grasslands from my camp, the only

On the Cover

THE author's native carriers at Pyrethrum Camp, at 7,700 feet on Nyika plateau in northwestern Nyasaland, during the Vernay Nyasaland Expedition of 1946, on which living plants and herbarium specimens were collected by Mr. Brass for the New York Botanical Garden.

SMOOTH GRASSLANDS OF NYIKA'S DEFORESTED PLATEAU

A line of low woody vegetation marks the slightly raised banks of a stream which is flanked by narrow, boggy flats. The grasslands above are characteristic of this area.

juniper trees known to occur in Nyasaland. The species is *Juniperus procera,* the East African pencil cedar, here at the southern limit of its recorded range. It is the dominant tall tree of a patch of forest, about five acres in area, in the valley of a stream called the Uyaghaya. This little relic of undisturbed forest and a clumped and serried stand of some hundreds of other trees of the species are all that survive the fires that gutted or entirely consumed the forest where they started life.

My trip to the juniper forest was made on the one clear day I had in ten on Nyika. A severe chiparone closed down on the second day of my stay, and for the remainder of the time I groped around in mist and rain, broken by only rare spells of warming sunshine. The forests and grasslands yielded many plants new to the collection. Most exciting of all, and one of the botanical prizes of the expedition, was a giant *Lobelia,* growing in boggy bottoms and sending up spent, club-like flower spikes to a height of 8 or 10 feet from bunches of big greyish leaves. The giant lobelias look like grotesque relics of a bygone age, and they are an ancient group of plants now found in widely separated mountain stations, as, for example, in tropical Africa, tropical South America, and some eastern Polynesian islands. My Nyika find extends their known range in Africa south to Nyasaland.

Nchisi was the only mountain we saw in Nyasaland on which no great apparent change in vegetation had taken place as a result of disturbance by man. We were at Nchisi late in July and again in early September. The mountain rises from the western escarpment of the Rift and overlooks Lake Nyasa, 4,000 feet below and distant 20 miles. It terminates in a sharp ridge with a patch of several hundred acres of rain-forest on its eastern or weather side. Parts of this rain-forest are dominated by immense trees of *Piptadenia Buchananii,* while ferns, mainly *Dryopteris* and *Asplenium* species, abound in its ravines. Showy shrubs of the forest borders include species of *Tecoma, Dombeya, Dissotis, Cassia* and *Hibiscus.*

Of chief interest, however, were the prevailing brachystegia woodlands. The effects of the dry season were beginning to be evident in July. The natives had started their annual firing of the grass, but in moister parts of the woodlands, numerous plants of the Leguminosae, Labiatae, and such composites as *Helichrysum* and *Vernonia,* were still in flower. Brachystegias of several species are a useful source of fiber. From their bark the natives beat out bark cloth, and make strong rope used to bind the timbers of their mud-walled and grass-thatched huts.

After dropping most of their leaves, in the first week of September the brachystegia trees of Nchisi had broken out into new foliage and the mountain was a riot of color. The young leaves hung limp as if poured from the buds, in all shades of red, besides greenish and coppery browns. The

RELIC PATCH OF JUNIPER FOREST ON NYIKA PLATEAU

This is the only remaining patch of juniper on the mountain, the rest apparently having been burned away before protective measures were taken by the Government. It occurs at about 7,200 feet in the valley of the Uyaghaya stream. A recent fire, which burned over the neighboring grasslands, was stopped by the firebreak which now surrounds this forest.

color effects were as impressive, and they aroused the same elemental exuberance of spirit as the fall displays of New England, but the colors were more intense and the foliage thinner.

Summer begins with the leafing-out of the brachystegias. It seems that in these dry tropical woodlands the growth cycle of many plants is influenced more by temperature, and perhaps length of day, than by available ground moisture. The dry season is well advanced when the brachystegias burst into leaf. Grass fires also play their part in the process. They hasten the leaf fall and this is followed by an earlier showing of young foliage.

After the burnings of the cool months and brief spring the grasses send up green shoots, and with the fresh young grass appear the bright flowers of many perennial herbs, while not a sign of new growth shows on neighboring ground that escaped the fires. These perennials produce their shoots from blackened woody stubs or from hidden taproots and bulbs. They flower before the first summer rains. It seems, rather, a flowering in anticipation of the rains.

Down in the flat country of the Chia, on the Lake Nyasa littoral, different species of *Brachystegia* combine with *Uapaca sansibarica, Parinarium Holstii, Afromosia angolensis* and other trees to form more complex, taller and shadier savanna-woodlands traversed by open moist flats called DAMBAS. In one big damba near camp thousands of blue and lilac water-lilies (*Nymphaea*) were flowering in an area of open water bordered with tall reeds and *Papyrus antiquorum,* the papyrus sedge of the Nile. In late August, when I arrived there, the dry season was too far advanced for good plant collecting. But in the Chia, the expedition had good hunting and collected most of its larger mammals. Hartebeeste, waterbuck, reedbuck, zebra, buffalo and rhino grazed or browsed on abundant green feed on the burnt country and frequented the waterholes. Leopard, lion, and scavenging hyaena followed the herbivores and prowled around camp after dark. Hard-biting tsetse flies were troublesome during the day, their favorite place of attack being the back of one's neck. I should add, however, that although very numerous, few if any of the Chia tsetse flies were of species that carry sleeping sickness to humans.

Our field work ended in the first week of October at Chikwawa, in the unhealthy lower valley of the Shire River. From the disused BOMA house or government residence which we occupied, there was a fine view of the winding river and of the 5,000-foot mountains of the eastern escarpment of the Rift. The air was thick with the smoke from grass fires which burned day and night on the river plains and on the mountainsides. Temperatures rose to nearly 100° F. in the shade during day and kept above 80° through the night. As our pidgin-speaking boys put it, it was "hot too much." We found we could not be very active in the field between nine in the morning and late afternoon.

FOUR VARIED VIEWS OF NCHISI

Below are *Erythrina* trees, leafless but gay with red flowers in September, growing on formerly cultivated plateau lands edging the Rift near Nchisi at 4,000 feet. In the center are orchids growing as epiphytes on the limb of a *Brachystegia* tree high up on Nchisi mountain. Above the orchids is a bright yellow composite with flowers resembling *Gazania*, one of the many perennials which flower before the rains in the burned savanna-woodlands at Nchisi. Above at the left is the slope of Nchisi mountain, on the western exposure.

In many ways Chikwawa reminded one of the picture-book Africa: Picturesque country, shooting country, and not much influenced by Europeans. Living in big sprawling villages, the natives cultivated their maize and bananas largely on the moist flood plains of the river. On higher flat land reaching back from the river they grew cotton. David Livingstone, first

IN AND NEAR CHIKWAWA, SOUTHERN NYASALAND

Upper left. The Lower Shire river, looking upstream from the Chikwawa boma house. The rich flood plains are intensively planted to mealies (corn) and bananas. Across the river is the high eastern escarpment of the Rift. *Upper right.* A baobab tree in the lower valley of the Zambezi, near Tete, in Portuguese East Africa. *Lower left.* A termite nest such as is often seen along roadsides in this region. *Combretum* is in the right foreground. *Lower right.* Cotton market at Chikwawa. The bales and baskets are carried to market on the heads of the native growers, weighed, then ginned for export.

white explorer of Nyasaland, saw cotton in cultivation here and visualized the Shire lowlands as a center of production for the cotton mills of England, then cut off from major supplies by the War of the States. Livingstone's dream never came true, but King Cotton does hold modest sway on the lower river.

The prevailing savanna-woodlands differed strongly in floristics from those of the higher country. The trees generally were bigger, leafier, and more individualistic in character. Here acacia trees, especially the large *Acacia albida,* appeared in abundance. Others of the larger trees included *Cordyla africana,* its orange flowers scenting the still air, *Combretum imberbe, Sterculia africana* and *S. appendiculata,* the latter with blotched grey and green bark like that of a sycamore.

Immense baobab trees, leafless in October, occurred in islands of dry brushy forest, home of the rare nyala antelope, and in the woodlands. Sausage trees (*Kigelia aethiopica*), whose pendent strings of big musky flowers were visited and perhaps pollinated by bats, were common on low-lying ground. Mr. B. L. Mitchell, Tsetse Control Officer, told us of his observations on squirrels which bit into the hard fruits of the sausage tree, waited for fermentation to set in, then lived in a state of mild intoxication on the product, never straying far from the tree being exploited by their particular group.

It was with regret that we left Nyasaland. Its possibilities for us were far from exhausted when the time came to pack our collections, pay off our native helpers, and make a last round of calls on the government officials and the many private residents who had shown friendly interest in our work and given unstinted help in making it a success.

The Nyasaland Illustrations

THE photographs which illustrate this concluding installment of Leonard J. Brass's account of the Vernay Nyasaland Expedition of 1946 have come, like those in the preceding number, in part from the author's own kodachromes and in part from the black and white photographs of Dr. Harold E. Anthony, Chairman of the Department of Mammals at the American Museum of Natural History, who was also a member of the expedition.

Although Dr. Anthony's role in Nyasaland was mainly to collect mammals, his natural interest in plants kept his eyes alert, particularly for those that might prove amenable to cultivation in his own small greenhouse in New Jersey. Following his observations on "How Rhipsalis, an American Cactus, May Have Reached Africa", which appeared in the Journal in February 1948, he will contribute an article entitled "A Succulent Fan in Nyasaland" to a forthcoming number of this magazine.

Genius of Formal Garden Design

A Comment on André Le Nôtre

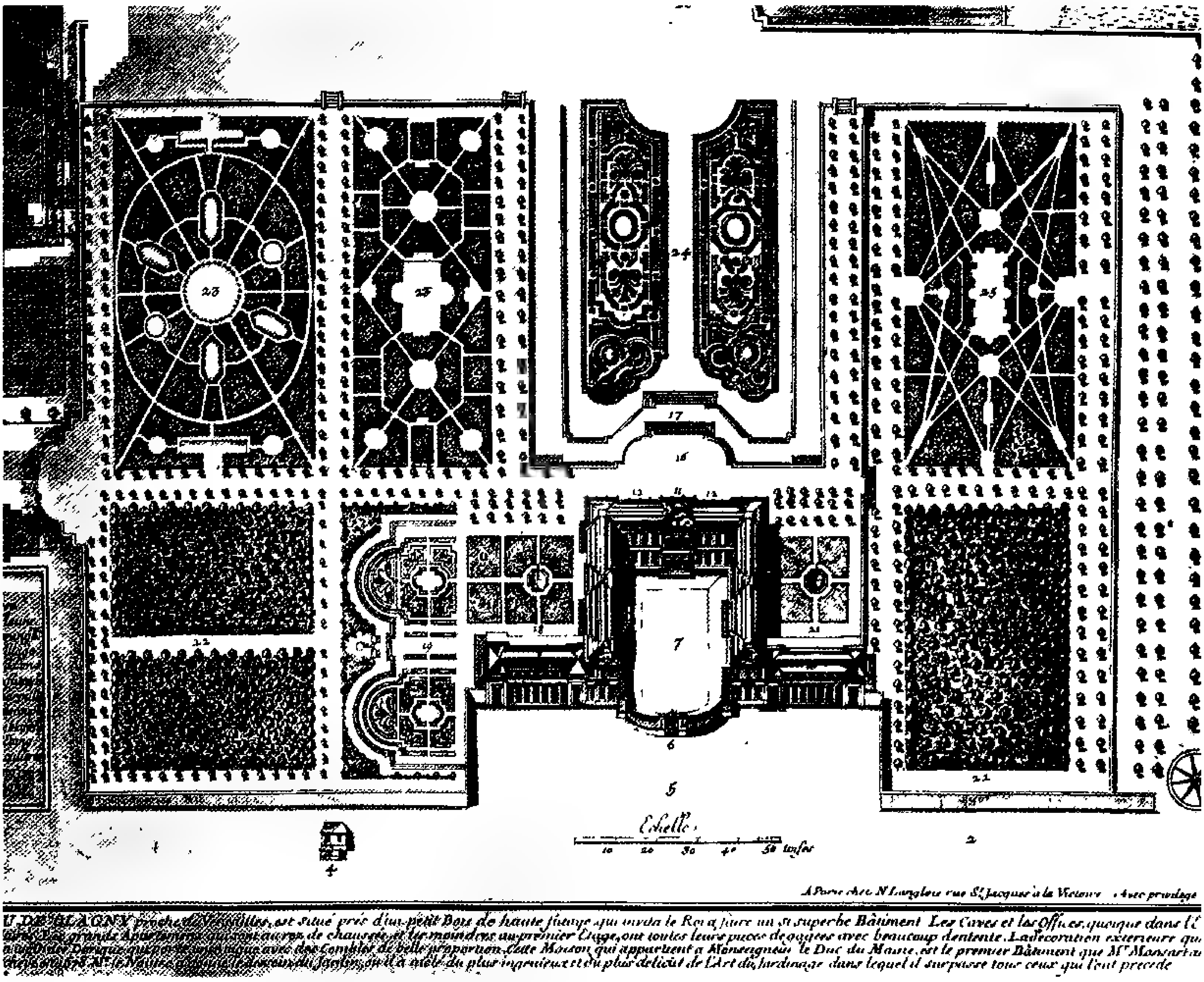
By Helen M. Fox

IF André Le Nôtre had designed the park at the New York Botanical Garden, the main vista bordered by two tree-lined roads leading out from the Administration Building, which now terminates in a cross axis, would have been a very wide long stretch of green, leading directly to the center of the conservatory. Other roads would have led out from the doors of the Administration Building. The rock, rose and bulb plantings would all have been laid out so as to form a geometric unity and fit into an over-all pattern, which would have been related to the main building and emphasized its importance.

Le Nôtre was the outstanding designer of classical gardens, which are also called architectural or formal. No one in this field has ever done so much work as he or carried out this style so superlatively—that is, no one known to history. In his 87 years (1613-1700), during the reigns of Louis XIII and Louis XIV, he remodeled many old gardens and designed almost all the new parks built in his day. These were situated all over France from Versailles, Chantilly and St. Cloud in the country to city gardens in Bourges, Meaux, Castres and Paris. The list of his work includes also gardens in Italy, Germany, Belgium, and England. He went to England at the request of Charles II and while there arranged to make designs for St. James, Hampton Court and Chatsworth.

Louis XIV was very fond of Le Nôtre, appreciated his ability, and realized that his accomplishments would redound as much to the glory of his reign as the plays of Molière and Racine, the poetry of La Fontaine and the paintings of Le Brun, Poussin and Lorraine, and as also the accomplishments in statecraft of Colbert and in war on the part of the Prince de Condé and Turenne. Le Nôtre was always well paid and became wealthy. Since his three children all died young, he spent much of his fortune on a superlative art collection. Some of this, which he gave to the King, is now housed in the national museums of France.

Today in France Le Nôtre is not only known as a great gardener but because his personality was beloved he has become part of the folklore of the country. To Frenchmen, because he was the son and grandson of gardeners, he represents a man of the people, who worked with his hands, but who, through his outstanding ability became one of the great artists of all time. Yet he never forgot his origin; on the contrary, he was proud of it. Moreover, Le Nôtre was unique for his probity and honesty at a court where the King and courtiers lived openly with their mistresses and privileges depended almost entirely on royal favor.



DESIGN FOR THE GROUNDS AT THE CHATEAU DE CLAGNY, NEAR VERSAILLES

The lines at the bottom of the plan are devoted principally to a description of the buildings and location, but at the end is the single sentence (translated): "Mr. le Nautre designed the garden, in which he has combined the greatest ingeniousness and delicacy known to the art of gardening, in which he surpasses all those who have preceded him."

The grandfather of Le Nôtre, Pierre, had been head gardener at the Tuileries under Henry IV, and his father, Jean, succeeded him there. André, in his turn, began work alongside his father in the same garden. The gifted scion of such a family was naturally given training considered the best to prepare him to be a designer of gardens. First he was sent to the court painter, Simon Vouet, to learn about composition and colors, then to an architect (it is not known which one) to learn how to build walls, garden houses and stairways for gardens. After these experiences he returned to the Tuileries where he helped his father. At twenty-eight he was made a royal gardener in his own right. Shortly thereafter he was given his first job of remodeling, of which he was to have many throughout his life. This first remaking of an old garden was at the Luxembourg in Paris, which is now a public garden, a favorite place for children.

In the day of Le Nôtre no style of laying out beds and paths other than the classical had been conceived. Nature was feared and not enjoyed, so there was no idea of recreating meadows, winding streams, or natural woodlands, as there has been in the romantic, naturalistic or informal design of gardens which rose in the century after Le Nôtre and reached

ANDRE LE NOTRE

(From a painting by Carlos Marata)
Designer of gardens for kings and exponent of the formal style of the seventeenth century.

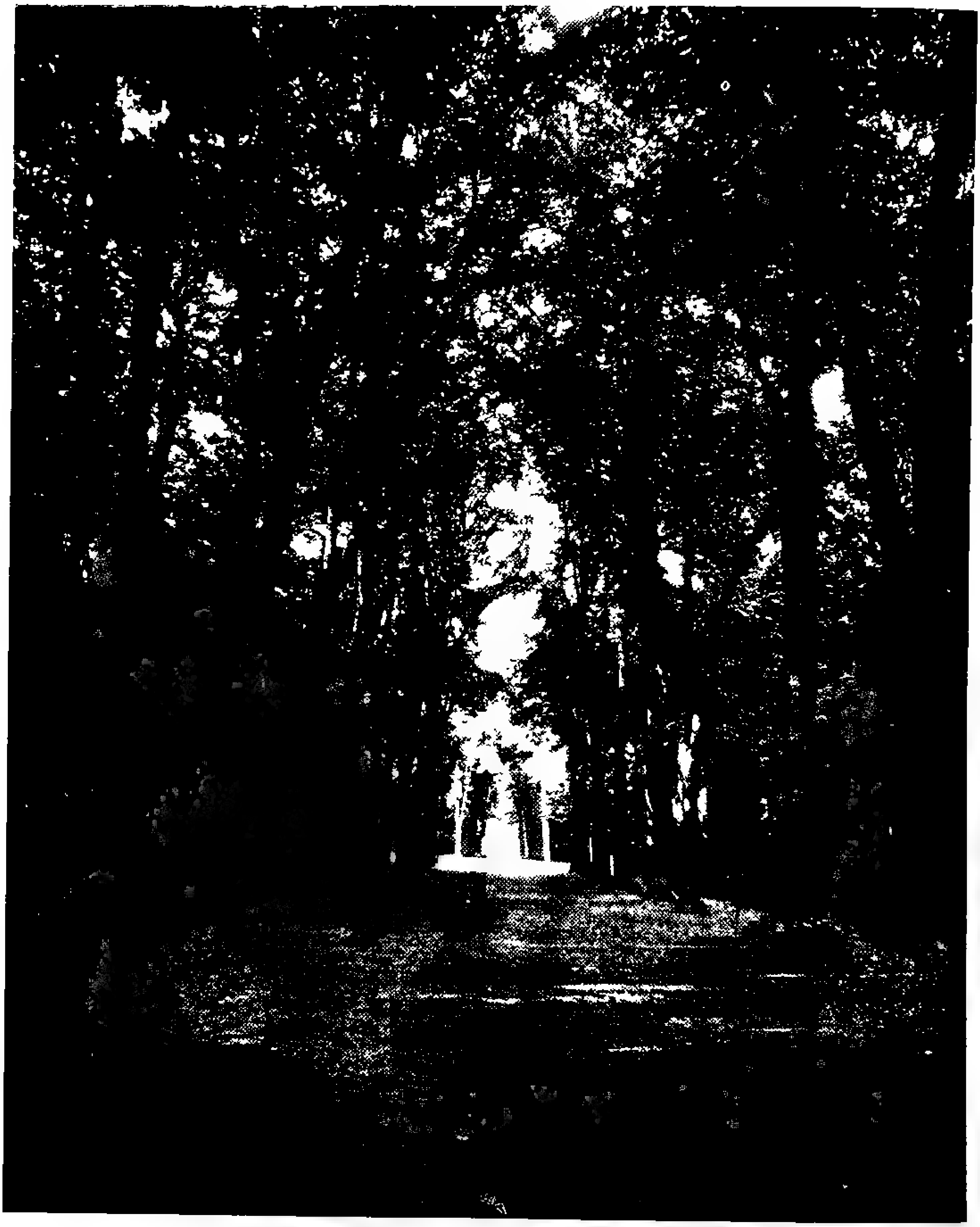
its apogee under Humphrey Repton in England. In the last garden designed by Le Nôtre at the Trianon, he thought he was planning a naturalistic scene and spoke of streams encircling trees and shaded paths under trees, but his garden vocabulary, his way of carrying out these ideas, was strictly geometric. His gardens reflected the thought and life of his day where the curves and lines of geometry, recently developed by Pascal and Descartes, and the strict delimitations of class and rules of etiquette practiced by the people who lived under an absolute monarchy, inclined them to exact forms in art. Their drama was modeled on the three unities of the Greek, their poetry written in the Alexandrine rhymed couplet; their clothes were stiffened with buckram and whalebones, and their manners were highly artificial and formal. Similarly in the gardens, every stream flowed between banks of stone or marble, the paths as also the beds were laid out to grow into geometric outlines, the trees and shrubs and even the flowers were clipped to form set patterns.

Because he was a genius, Le Nôtre's parks and gardens not only express the thought of his time but they have a grandeur and sweep, a balance and dignity which makes them superb when viewed in any age. He was completely master of the scenery in his parks, for to carry out a picture, he leveled mountains, changed the courses of rivers, and built great stairways and terraces. The grading was as smooth as the marble surfaces of the many statues which bordered paths and pools. In the handling of composition, light and colors, the effect of his gardens, which were always set in a frame of trees, was similar to the effect of painting by Poussin or Lorraine. These gardens were predominantly green gardens and their principal ornaments were statues and fountains. For all but a few of the roses, magnolias, rhododendrons and lilacs which ornament gardens today were still growing undiscovered by Europeans in the forests of North America and on the mountain slopes of western China.

The paths were always wide enough for light to come across them and fall on a statue. In his woods the light shone through the trees to brighten a bench or cast rainbows on the jets of a fountain. Paths through these woods, made in the shape of a goose's foot (*patte d'oie*) radiated from circular openings and provided vistas through the green of trees standing like columns in a vast cathedral.

A Le Nôtre garden is an example of discipline imposed by man on nature. Mind rules supremely in them. The whole garden forms a unity with the house and each part is related to the whole, and every feature is balanced by another of equal size and importance. The land has been smoothed, graded and planted to form a picture imagined by the artist who created it.

The designers of romantic gardens also carried out a picture they had imagined, but they reproduced scenes from nature whereas Le Nôtre and his school created scenes which were entirely architectural and geometric.



VERSAILLES, THREE CENTURIES AFTER LE NOTRE

"The paths were always wide enough for light to come across them and fall on a statue." A marble group is barely visible at the open crossing of the paths where the sun shines through in the distance. This is a present-day photograph of one of the plantings of Le Nôtre along a walk at Versailles.

There is no ugly style of gardening. Each is beautiful when it is used in a suitable place. The only ugly garden is one where there has been no plan and where the garden does not follow the three fundamental rules crystalized by Le Nôtre and his school. These rules are: The garden should be suitable and appropriate to the climate; it should be harmonious with the house; it should express the owner's taste and be consistent with his pocketbook.

In his own incomparable style, Le Nôtre was a master of these fundamental rules, which apply whether the garden is romantic or classical in style.

Garden Club Day May 20

MEMBERS of the Garden Club of America were guests of honor of the Board of Managers of the New York Botanical Garden at an all-day program at the Garden May 20. The day was one of the warmest and pleasantest that had been experienced in the vicinity of New York in several weeks.

Immediately after the luncheon which was served in the Museum Building, staff members guided the 150 guests on a tour of the ornamental plantings. The rock garden appeared at the height of its bloom, the rhododendrons to the north were in abundant flower, and the azaleas brightened the woodland paths and roads with masses of orange, yellow, white, and many tones of pink. Near the Conservatory the tulips were still colorful, although past their prime.

At 3 o'clock, in a lecture hall transformed with flowering plants and floodlights, and with a map of the world at the back of the stage, T. H. Everett talked on some of the plants from distant countries and some of the interesting hybrids that the Botanical Garden is growing and propagating. He was followed by Dr. William J. Robbins, who spoke on the importance of plants, not only for beauty and for life and its comforts and conveniences, but also as materials for scientific research. During his address he explained the work of the Garden and the need for further research in taxonomy, plant pathology, genetics, and other botanical fields. He also emphasized the need for further plant exploration, particularly in those parts of the world, comprising approximately one-third of the earth's land surface, which are virtually unknown botanically. Dr. Robbins then described his own work on antibiotics and growth problems, and their relation to the medical fields of tuberculosis, infantile paralysis, and cancer.

Tea was served in the Members' Room at the conclusion of the afternoon program.

In charge of arrangements for the day was Mrs. Donald B. Straus, assisted by Mrs. Charles Burlingham, Mrs. H. Harvey Pike, Mrs. Grafton H. Pyne, and Mrs. Philip B. Weld, with a large committee of hostesses.

New Type of Tree Sprayer at the Garden

By P. P. Pirone

A DEMONSTRATION in the spraying of shade trees with a new type of machine which can shoot a fine cloud of dust or spray above the tops of 100-foot trees took place at the New York Botanical Garden May 4 through the courtesy of the Starner Tree Service Co. The new device, called a jet-air tractor sprayer, has been developed by H. Palmer Starner of Scarsdale, arborist, who is head of the company. The principal trees sprayed were the tulips lining the drive to the Museum Building and the American elms. It is expected that the single application of the spray will control all the more important insect pests on these trees until mid-July or later.

Heretofore most tree spraying has been done with the conventional hydraulic sprayers which use large quantities of inert water to propel a few pounds of insecticide. Such sprayers use from 100 to 1,200 gallons of diluted spray to cover an area of an acre.

The jet-air sprayers utilize a high-velocity air current, up to 150 miles an hour, to propel a concentrated liquid or dust insecticide. With such machines it is possible to apply concentrated sprays at the rate of ½ to 12 gallons an acre. Thus they provide rapid coverage of trees at a minimum of cost and labor.

Two machines provided by Mr. Starner were used in the demonstration. The smaller one delivered air to propel the insecticides at the rate of 8,000 cubic feet per minute; the larger one, 16,000 C.F.M. Each machine was run by one man who could control the direction of the air stream simply by operating a small hand lever. Enough concentrated fungicide was carried in a 50-gallon tank on each machine to permit operating throughout the day.

In addition to the machines, Mr. Starner also donated the required personnel to man them, as well as some of the insecticidal dusts used during the morning demonstrations.

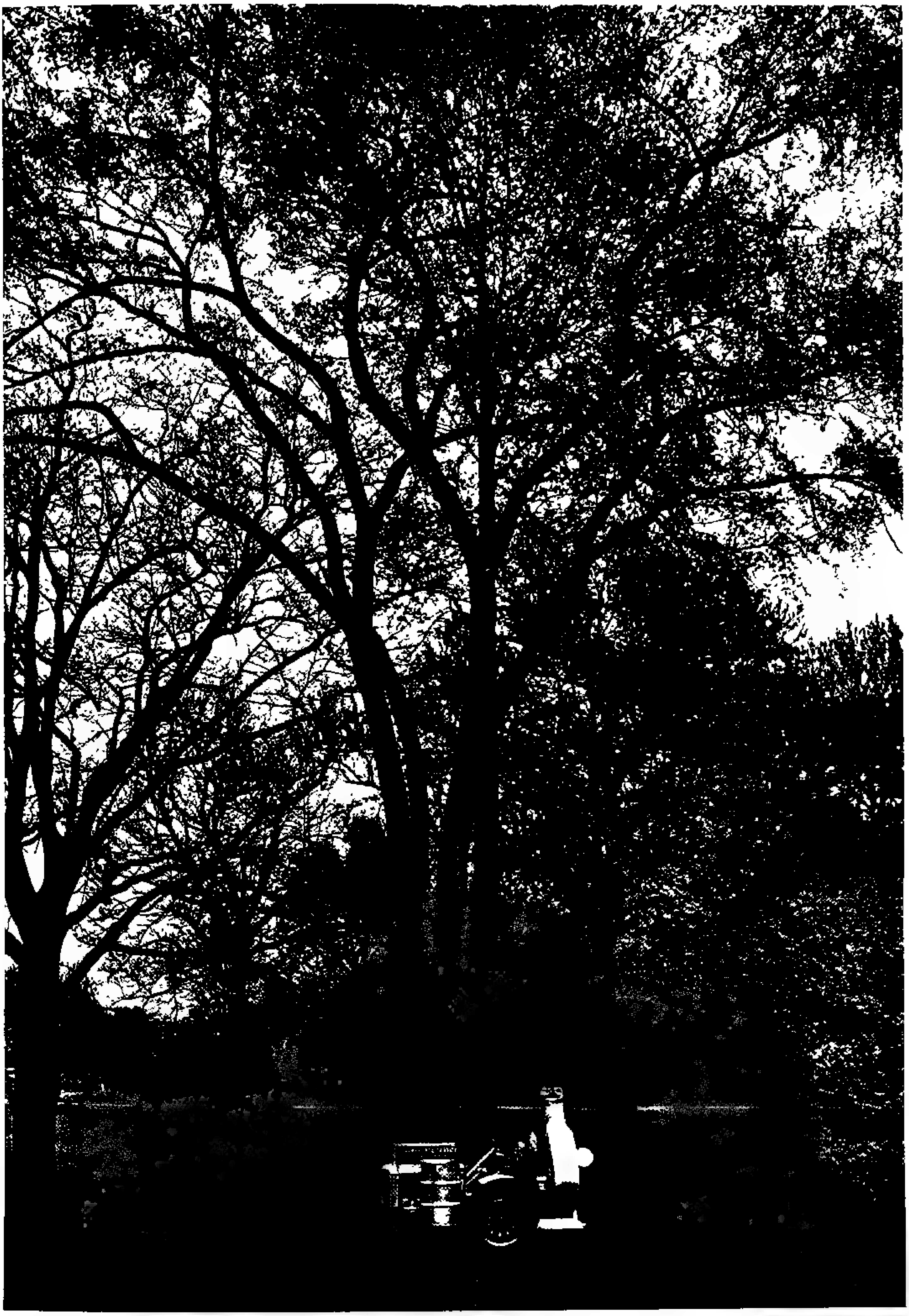
The Shell Oil Co. provided the two principal insecticidal sprays used and, through its entomologist, C. S. Harris, supplied technical information and service to the Garden's plant pathologist.

The insecticides, with some of which nicotine sulphate was combined, were applied to control both chewing and sucking insects. Among these are such common pests of elms as leaf beetle, bark beetle (which carries the Dutch elm disease fungus), and such gross feeders as cankerworms and other caterpillars. The sprays used will also control such pests of tulip trees as scales and aphids. A second application about mid-July should protect the trees for the remainder of the 1948 growing season.

Among those who witnessed the Starner jet-air tractor sprayers in action on May 4 were, besides members of the Garden's scientific staff and employees in the horticultural department, arboriculturists of the New York City Department of Parks, headed by David Schweizer, several men from the New York Zoological Society, technical representatives from the Shell Oil Co., and M. W. Abbey of the International Basic Economy Corporation of New York.

INVISIBLE ACTION

The spray from the new type jet-air tractor sprayer demonstrated at the New York Botanical Garden was so fine that it could not be seen as it shot to the top of the elm tree on the lawn near the Museum Building. In another demonstration, dust was added to the mixture to show the spectators the height to which the insecticide would reach. This is the larger of the two machines donated for the day by the Starner Tree Service Co. (Photograph on the opposite page by courtesy of the Shell Oil Co.)



TREE SPRAYER DEMONSTRATED AT THE BOTANICAL GARDEN
(For description, see the opposite page.)

NOTICES AND REVIEWS OF RECENT BOOKS

Rosarians' Reference, Revised

ROSES OF THE WORLD IN COLOR. J. Horace McFarland. 296 pages, color illustrations, index. Houghton-Mifflin Co., Boston, 3rd edition, 1947. $5.

The fact that there is a third edition of this book indicates its value. It is still in demand. The present edition brings it down to date.

The author has grown roses himself for more than 50 years, has travelled widely in Europe, and has been acquainted with the great rose growers of Europe and America. He has also been President of the American Rose Society, and for many years the editor of its publications, and in this book he speaks out of this long experience and knowledge.

In the early part of the volume, there is a brief but excellent history of the rose, followed by concise discussions of the different phases of rose culture. Then come 288 pages of lists of the best roses of the world with a brief description of each. If this were all it would be a book invaluable to every rosarian. There are, however, in these 288 pages very fine illustrations of a large percentage of the roses described, giving not only the color of the roses but, as well, an excellent idea of their form and substance. The book should be on the library shelf of anyone growing roses. No person is better qualified to write such a book than Dr. McFarland.

GEORGE A. SWEETSER,
President, American Rose Society.

Guide for Gardeners Who Freeze Their Own

QUICK FREEZING AND FAMILY FOOD GARDENING. Gordon Morrison. 220 pages, illustrated, indexed. Stephen Daye Press, New York, 1948. $2.75.

This is a very usable book which gives clear and experienced advice for the gardener with a home freezer or locker in a frozen food plant. The first 75 pages are given to chapters on planning the garden, estimating amounts needed, selecting seeds and plants of varieties best suited for quick freezing (an especially helpful section), preparing and fertilizing soil, planting and raising seedlings, cultivation of growing plants, and control of pests.

The second and greater part of the book deals first with description and use of home freezers and the freezing process with something on types and cost of operation. General procedures for preparing and freezing meats, fish, poultry and other foods are included, also good charts of standard meat cuts. Then there are detailed directions, 33 pages for selecting, growing and processing a variety of specific vegetables. The last part deals with fruits in the same way, all kinds of berries and tree fruits, planning the orchard, selection of varieties, pruning, spraying, and processing and freezing the fruit.

THERESA C. RICKETT.

Mathematics Applied to Life

GROWTH AND FORM. D'Arcy W. Thompson. 1116 pages, illustrated with charts, drawings, and photographs. Indexed. Macmillan, New York, 1942. $12.50.

The new edition of Professor D'Arcy Thompson's classic has been greatly expanded by the addition of new material, though the number of chapters and their headings have remained unaltered. The book is concerned with the deducing of mathematical principles from the study of a very wide range of biological forms. It opens with a discussion of the philosophy of organism with special reference to the concept of final cause. The author states the object of his work thus:

"My sole purpose is to correlate with mathematical statement and physical law certain of the simpler outward phenomena of organic growth and structure or form, while regarding the structure of the organism, ex **hypothesi**, as a material and mechanical configuration."

Subsequent chapters of the book provide material in which the forms of whole organisms, tissues, and cells are studied from the standpoint of the laws which they appear to demonstrate. Rate of growth as well as direction of growth is discussed, and special attention is directed toward the relationship of the two. Interesting analogies are drawn between forms generated by the expansion of certain mathematical expressions, by certain chemical interactions and by living organisms. Special attention is paid to the mathematical formulation which can be derived from a study of phyllotaxy in plants, it being shown that the arrangement of leaves on a stem or florets on a capitulum obeys definite laws, the arrangement generally following the mathematical formula known as a Fibonacci series. Descriptions are given of the use of the "standard frame" now so widely employed by students of relative growth, especially to the study of related forms.

ROBERT S. DE ROPP.

Rock Gardens—Construction, Planting, and Care

ROCAILLES FLEURIES. Aymon Correvon. 214 pages, illustrated. Delachaux et Niestlé S.A., Neuchâtel, Switzerland. 1947. 15 fr.

The name of Correvon, in Central Europe, for many years has been associated with alpine plants. The numerous volumes of Henry Correvon, small but tightly packed with text and pictures, have gone into many editions in Switzerland. "Fleurs des Champs et Bois," "Flore Alpine," and the others now have a companion volume in "Rocailles Fleuries," which is dedicated to the memory of the elder Correvon by his grandson Aymon.

Every phase of rock-garden planning, construction and culture seems to be covered in this book, which starts with the history of rock gardens and a short chapter on the origin of mountains and rocks. Sketches and photographs make the directions for building a rock garden easy to follow, even though written in French. Different types of rock, soil and terrain are discussed, also the use of water in the rock garden scene; suitable warnings are given against over-ambitious planting, inimical soil, and common pests. Propagation and botany — "un peu de botanique" — each occupy a chapter, and the discussions and lists of appropriate plants for all the different sorts of rock gardens are almost overwhelming. More than two dozen are shown in well done color illustrations.

CAROL H. WOODWARD.

Courageous Gardener

THIS WAS EVER IN MY DREAM. Caroline B. King. 297 pages, illustrated. Caxton Printers, Caldwell, Idaho, 1947. $3.

The dream came true! Mrs. King has written a delightful, fascinating book telling us how it came about. In it are accuracy, pertinacity, happily mixed with the frustrations of humans, Mother Nature, and temperamental plants. The author has achieved a good combination of technical information for the erudite and plant lore for the run-of-the-mill gardeners — all made more attractive with fine illustrations. Her narrative inspires one to try his or her own dreams.

But why that commercial patter "gladiolas" instead of the legitimate *gladioli?* The first tends to destroy proper nomenclature which *gladiolus* and *gladioli* support.

It was doggedness that made the dream come true. Other gardeners might well pursue this course, forgetting failures, laughing at them, glorying in successes. The book, with its truths and chuckles, its confessions of disappointments and evidence of the author's indomitable courage, is well worth reading.

ANNE DORRANCE,
Wild Ledges, Dallas, Penna.

Fish Amid the Flowers

FISH PONDS FOR THE FARM. Frank C. Edminster. 144 pages, illustrated. Charles Scribner's Sons, New York. 1947. $3.50.

To long for a farm and even to acquire one is the current fashion. Some people merely want to loaf amid their acres; others want to grow successful crops. Now Mr. Edminster comes along and pictures a homemade fish pond so attractively that it alone would seem to be sufficient reason for owning a farm. He gives detailed instructions for building a fishpond literally from scratch. His technical data should be of value to the designing engineer as well as to the owner. He discusses aquatic plants—particularly the undesirable ones—and devotes a chapter to landscaping of the pond area, offering lists and plans.

The author is chief of the Northeast Regional Biology Division of the U. S. Soil Conservation Service.

CAROL H. WOODWARD.

Notes, News, and Comment

Du Pont Tour. More than 400 persons visited "Winterthur," the estate of Mr. and Mrs. Henry F. du Pont, near Wilmington, and "Longwood," the estate of Pierre S. du Pont at Kennett Square, near Philadelphia, on a garden tour May 6, arranged by the New York Botanical Garden's Manhattan office. This was the second annual pilgrimage made to the du Pont gardens under the Botanical Garden's auspices. Members of the Federated Garden Clubs of the New York area were the Botanical Garden's guests this year.

Miss Anna R. Alexandre and Mrs. Blake L. Lawrence were co-chairmen of the committee in charge, which included also Mrs. Robert F. Corley, Mrs. Lewis M. Hull, Mrs. Donald B. Straus, and Mrs. Laurance N. Wilson. There was also a committee of 28 hostesses. Luncheon was served at "Winterthur," where the visitors enjoyed azaleas naturalized in woodlands, an extensive collection of other flowering shrubs and trees, a walled garden, and other spring flowers, including many bulbs.

Five acres of conservatories were the principal attraction at "Longwood," where lawns, shrub borders, flower beds, azaleas, fruit trees, orchids, and many other tropical plants were seen in cultivation under glass. Outdoors the extensive arboretum and the series of decorative fountains, each in a garden setting, drew the attention of many of the visitors.

Serving as guides were E. J. Alexander, T. H. Everett, Elizabeth C. Hall, and P. P. Pirone from the Garden's staff, in addition to James G. Esson, James B. Jack, and P. J. van Melle.

Representative in Utrecht. At the symposium on botanical nomenclature and taxonomy, which will take place in Utrecht, Holland, June 13-19, Dr. H. W. Rickett will represent the American Society of Plant Taxonomists, the Mycological Society of America, and the American Phytopathological Society, as well as the New York Botanical Garden. The main purpose of the symposium is to obtain a series of definite proposals for the revision of the International Rules of Botanical Nomenclature, to present at the International Botanical Congress at Stockholm in 1950. Dr. Rickett is taking with him the proposals submitted by American taxonomists, as prepared by a committee of their society. Dr. W. H. Camp is chairman of this committee, of which Dr. Rickett and Dr. C. A. Weatherby of Harvard are members. Dr. J. Lanjouw of the Botanical Museum and Herbarium at Utrecht is secretary of the conference.

Other questions on the agenda are the improvement of international contacts among plant taxonomists and institutions, through discussion of the consequences of the complete loss of important herbarium material at such centers as Berlin-Dahlem and Manila during the war, discussion of the continuation and/or renovation of some of the world's important publications on taxonomy, and consideration of an International Society of Plant Taxonomists. There will also be informal discussions of other scientific problems in taxonomy in preparation for the Stockholm meetings.

During his visit to the Garden April 23, Dr. John A. Stevenson conferred with Dr. Rickett on mycological problems in taxonomy to be given consideration at the Utrecht conference.

Meadow Map. School children of New York City began last month to use a map of the meadow at the New York Botanical Garden, which has been prepared to guide them on nature study trips. Containing the name and location of every woody plant and of all geological features in the grassy, rock-bordered area directly south of the Rock Garden, the map was prepared as part of a science curriculum research project of Districts 21-22 of the Board of Education, under the direction of Johanna M. Hopkins, Assistant Superintendent.

Jerome Metzner of the Bronx High School of Science, who is a science coordinator for the two districts, had charge of the map's preparation. Farida Wiley of the American Museum of Natural History, Thane Bierwert, photographer, and E. E. Naylor of the New York Botanical Garden assisted. In addition, all plants listed were checked by E. J. Alexander.

As teaching aids in connection with visits to the meadow, which is recognized as one of the best natural areas available to the New York school children for their nature study work, the American

Museum of Natural History has prepared six lighted panels on glaciation and its effect on the meadow and on plants, animals, and man in their relation to the area. These are housed in the classroom on the main floor of the Garden's Museum Building.

Signs bearing an "M" point the way to the meadow from all the entrance gates and from the Museum Building.

May Ball. As part of the New York Botanical Garden's campaign for additional endowment funds, being conducted by the Manhattan office, a benefit ball to further the Garden's program of fundamental scientific research and exploration was given at the Plaza Hotel May 6. More than 500 persons attended. In addition to the money raised by the sale of tickets, generous contributions were made in the interest of the prizes offered, most of which were donated by retail firms.

With Mrs. Henry S. Fenimore-Cooper and Mrs. Harold Ruckman Mixsell as co-chairmen of the Garden's special events committee, the group directly in charge of the ball was headed by Mrs. Phipps Douglas. Other chairmen included Mrs. Albert Francke, Mrs. Thomas H. Choate, and the Misses Diane Dobbs, Anne Marie Tracy, Sydney A. Hatch, and Charlotte B. Van Bomal.

To direct the guests' attention to the need to "discover, cultivate, study, and develop the world of plants," the back of the program carried the following paragraphs, under the heading "All Life Depends Upon Plants":

"Food is a major problem in the world today. The further development of disease-resistant, more productive plants is vital in the coming crisis in civilization.

"Disease is often caused by plants. Yet, plants are also the source of some of our greatest therapeutic agents. *Penicillium notatum* is one of 100,000 molds. Further research in the molds may contribute to such major problems as the control of tuberculosis and infantile paralysis.

"Growth is fundamentally the same process in all simple living things, both plants and animals, as in man. Study of the problems of growth in plants may provide some of the answers to the control of cancer."

Tulip Day. Ninety members of the National Tulip Society and of the New York Botanical Garden ignored the cold rain of May 14 to take part in a program at the Garden. After inspection of the 130 named varieties of tulips near the Conservatory, the bulbs of which were presented to the Garden by the Associated Bulb Growers of Holland, the group heard a report from Margaret Herbst of her recent trip to the Netherlands. Tea was served by the Garden's Volunteer Associates.

Oldest Gardener Retires. Joseph W. Smith, in point of service the New York Botanical Garden's oldest employee, retired last month at the age of 73. It was on March 21, 1896, that he began working for the Garden and about five years later, when the Conservatory was erected, that he started looking after the plants that have been his special care since that time. In 1946 Mr. Smith's 50th anniversary at the Garden was observed by the staff and other employees at a ceremony in the palm house, reported in the Journal for May 1946.

Best Gardening Books. Elizabeth C. Hall is one of the compilers of a list entitled "100 Best Books for the Gardener's Library," recently published by the Holliston Mills, Inc., manufacturers of bookbinding fabrics. The list was selected by Paul F. Frese, Editor of *Flower Grower,* with the collaboration of E. L. D. Seymour, Horticultural Editor of *American Home,* and Miss Hall.

Herbarium Assistance. Alex D. Hawkes of Florida, a 1947 graduate of the University of Miami, majoring in botany, came to the New York Botanical May 1 on a six months' project of segregating types from the herbarium for safe-keeping. Mr. Hawkes contributed an article on "The Epiphytic Orchids of Florida" to the Garden's Journal in February 1945. During the war he wrote extensively on the orchids of the many places where his post with the Coast Guard took him.

California. Dr. William J. Robbins was guest of the California Institute of Technology at Pasadena April 12-15, and while there he addressed the staff on "Some Aspects of Growth." On April 13 he met with the Board of Trustees of the California Arboretum Foundation.

Back to Sweden. Returning from a sojourn of more than three months in the Hawaiian Islands, Dr. Carl J. F. Skottsberg, Director of the Botanical Garden at Gothenburg, Sweden, spent several days in New York around the first of May. Conferring with Dr. Robbins and several members of the staff April 29, he returned to the Garden May 1 to give a special lecture, illustrated with his newest kodachromes, on the Hawaiian forests that he had been studying during the winter.

Academy Honors. Dr. William J. Robbins was elected Treasurer of the National Academy of Sciences at the annual meeting which he attended in Washington April 26-28. He was also recently chosen a Fellow of the American Academy of Arts and Sciences, headquarters of which are in Boston.

Convocation Addresses. At Gainesville, April 19, Dr. W. H. Camp addressed a special convocation of the University of Florida on "Plants and the Coming Crisis." The following day he lectured on "Skyline Trails to the Yukon" at Florida State College, Tallahassee, and on May 1 he was convocation speaker at the University of West Virginia. During three weeks of travel in the South he collected extensively, particularly among the oaks, azaleas, and blueberries.

Superintendent. Charles Pecora, who has been foreman in charge of the propagating houses, left the services of the Garden in April to become Superintendent of White Gates Farm, the Bedford Hills estate of Arthur M. Anderson, Treasurer of the New York Botanical Garden. Mr. Pecora began as an apprentice at the Garden in April 1939. He became a student gardener in August 1941, and a year later left to join the U. S. Army Air Corps. After 3½ years of service, he returned to the Garden and was made outdoor foreman. Later he was appointed foreman at the "prop."

Living Fossil. Seeds of *Metasequoia glyptostrobioides* have been received at the New York Botanical Garden from Dr. Chung-lwen Wu of New Haven, and an attempt will be made to germinate them. This conifer is known as the "living fossil" tree because when it was discovered a few years ago by Dr. H. H. Hu, a Chinese botanist, it was recognized as a living counterpart of a species formerly known only from fossil records. The seeds were collected last October 31 from the type tree, which is located at Wanhsien, in eastern Szechuan, southwestern China. About a dozen of the seeds have germinated, and one of the seedlings was exhibited to the audience at Garden Club Day, May 20.

Help for Foreign Botanists. The relief committee of the Sullivant Moss Society has prepared a list of selected overseas workers in cryptogamic botany who are in urgent need of help. Copies of the list, with notes explaining what to send and how to send it, are available from Dr. Geneva Sayre, Russell Sage College, Troy, N. Y.; Professor William C. Steere, University of Michigan, Ann Arbor, or Dr. Frans Verdoorn, Chronica Botanica Co., Waltham 54, Mass.

Dedication. The current number of *Plant Life* (dated Jan.-Apr.-July 1946 and issued in April 1948) is devoted to the Verbenaceae and dedicated to Dr. and Mrs. Harold N. Moldenke. Mrs. Moldenke, who is a teacher of biology at Evander Child's High School in the Bronx, is co-author, with her husband, of the historical sketch of the Verbenaceae and related families which occupies the greater part of the issue.

Atomic Energy Commission. In Washington May 4 Dr. William J. Robbins attended a meeting of the Postdoctoral Fellowship Board in Biology and Agriculture of the Atomic Energy Commission of the National Research Council, of which he is a member.

Small's Manual. The 1,554-page "Manual of the Southeastern Flora" by John Kunkel Small, originally published in 1933 by the author, is now being handled by Orange Judd Publishing Company, 15 East 26th Street, New York 10, at $10.50 a copy.

Lectures. Dr. E. E. Naylor showed the Garden's films, "The Gift of Green" and "Plants and the Life of Man" and lectured last month before 300 members of the New York Florist Club, the Men's Club of the First Reformed Church in Tarrytown, and P.S. 33 in the Bronx. Dr. H. N. Moldenke talked on "Treasures of the Watchungs" before the Summit Garden Club April 21. The Barnard Botanical Club heard Dr. Richard A. Howard in a lecture on "Foods Used for Survival in the Tropics" March 18.

At Yale University May 11, Dr. B. O. Dodge addressed the Plant Science Club of New Haven on some aspects of his work with the bakery mold, *Neurospora*, offering evidence that the *N. tetrasperma* types of Ascomycetes are excellent basic material for many-sided research in plant science.

Dr. Donald P. Rogers spoke on "Botanizing in the Marshall Islands" before the New York Plant Quarantine Club April 27.

"Marvels in Adaptation Among our Local Plants" was the subject of Dr. H. N. Moldenke for the Working Gardeners of Bronxville April 28 and at Emanuel Baptist Church in Ridgewood, N. J., May 17.

The Rye Garden Club, an Affiliate of the Garden, heard Dr. P. P. Pirone speak on "Disease and Insect Control in the Garden" April 6.

Dr. William J. Robbins addressed the Torrey Botanical Club May 4 on "Observations on a Trip to Japan." On May 27 he told the graduating class of nurses at Fordham Hospital about the importance of plants in their chosen careers.

"The Gift of Green" was shown to an audience of more than 600 persons at 4 Irving Place, New York, March 10, under the auspices of the Edison Garden Club.

Mycology Course. Drs. B. O. Dodge and Donald P. Rogers have presented several weekly lectures in a course on general mycology being given to medical students at the Columbia University College of Physicians and Surgeons at the Medical Center in New York.

Radio. E. J. Alexander was guest speaker on Becky Reyher's program, "Fun With Your Children," over WNYC April 13.

Dr. P. P. Pirone appeared on John Gambling's program on WOR April 17.

During the International Flower Show, several members of the staff and two of the volunteer workers for the Garden's Manhattan office described the Garden's exhibit in radio interviews. Dr. P. P. Pirone, Mrs. John D. Beals, Jr., Mrs. Melvin E. Sawin, G. L. Wittrock, Dr. R. A. Howard and T. H. Everett appeared on programs.

Gardening Class. Joseph W. Tansey and James S. Jack are the instructors this spring in the Botanical Garden's class in Outdoor Flower Gardening, part of the Two-Year Course in Practical Gardening. Heavy registration has made it necessary for the class to be given both Wednesday and Thursday evenings.

Exploring. Dr. Richard A. Howard left April 21 for a six-weeks' collecting trip on Bimini and other islands in the Bahamas.

Contest. The annual A. Cressy Morrison prize contest has been announced by the New York Academy of Sciences. Two prizes of $200 each are being offered by Mr. Morrison for the two most acceptable papers in a field of science covered by the Academy or an affiliated society.

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue surface car to Bedford Park Boulevard

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $15.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. $6.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner. 1935. Second edition 1947. $2.

The Bahama Flora, by Nathaniel Lord Britton and Charles Frederick Millspaugh. 695 pages. Descriptions of the spermatophytes, pteridophytes, bryophytes, and thallophytes of the Bahamas, with keys, notes on explorations and collections, bibliography, and index. 1920. $6.25.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50. Foreign postage extra.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Plants of the Holy Scriptures, by Eleanor King, with a check-list of plants that are mentioned in the Bible, each one accompanied by a quotation. Revised from the Journal of March 1941. 23 pages, illustrated. 1948. 25 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal, 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

Catalog of Hardy Trees and Shrubs. A list of the woody plants being grown outdoors at the New York Botanical Garden in 1942, in 127 pages with notes, a map, and 20 illustrations. 75 cents.

Succulent Plants of New and Old World Deserts by E. J. Alexander. 64 pages, indexed. 350 species treated, 100 illustrated. Bound in paper. 1942. Second edition 1944. 50 cents.

Review of Juniperus chinensis, et al by P. J. van Melle. A study of the many varieties and forms of *Juniperus* which have been commonly included in the concept of *J. chinensis.* 108 pages, illustrated, bound in paper. 1947. $2.

Periodicals

Addisonia, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twenty-second volume. Published irregularly. Subscription price, $10 a volume. Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1.50 a year; single copies 15 cents. Free to members of the Garden. Now in its 49th volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.50 each. Now in its fortieth volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers published in co-operation with the American Society of Plant Taxonomists. Subscription price of volumes 1 through 5, $5 a volume ($4 to members of the Society). Now in its sixth volume. Price, $7.50 ($5 to members of the Society).

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. 96 parts now issued. Not offered in exchange. Prices of the separate parts on request.

Contributions from The New York Botanical Garden. A series of technical papers reprinted from journals other than the above. 25 cents each, $5 a volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Contents and prices on request.

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

Vol. 49

No. 583

JULY

1948

PAGES

153 — 176

DISPLAYS AT THE GARDEN IN JULY

Near the Conservatory

Pelargoniums of 100 or more varieties are a feature of the outdoor plantings this summer. They are located near the southeastern end of the borders of annuals.

The new herb garden, planned and planted in co-operation with the New York unit of the Herb Society of America, has acquired a finished look in the few months of its existence, and is a spot of unusual attractiveness. It is located on the site of one of the former model gardens, southeast of the conservatory.

Annuals are coming into bloom in the customary two long borders. At the south-eastern end is a trial planting of two dozen new varieties.

Formal beds of flowering plants surround the pools of waterlilies in the conservatory court. Against the outside walls of the central dome, many interesting tropical plants have been set out for the summer.

Lilies and ***Japanese iris*** are in bloom the early part of the month at either end of the conservatory.

Perennial borders—the Advisory Council's border planted for continuous bloom, and the other, at the opposite end of the conservatory, planned as a reference garden of perennial species and varieties—offer a succession of flowers throughout the season.

In the Museum

Two Centuries of Nature Printing. This exhibit includes 24 prints of grasses, leaves, and other natural objects, done by Arthur Rushmore of Harper & Brothers at his private press, The Golden Hind Press, at Madison, N. J. Each specimen is printed in color on hand-made paper and mounted on hand-made paper of harmonizing color, produced by Harrison Elliott of the Stevens-Nelson Paper Co., who presented a demonstration of paper-making at the Garden in 1946.

Also in the exhibit are spatter prints of ferns done by the late Mrs. Edna H. Provost of White Plains and presented to the Garden by her daughter, Margaret Provost.

Directions for making various types of nature prints are on view, and the Garden's library has contributed a dozen books dating from the 18th and 19th centuries in which the illustrations have been made directly from the specimens.

TABLE OF CONTENTS

JULY 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription $1.50. Single copies 15 cents.

JOURNAL

of

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VOL. 49 | JULY 1948 | NO. 583

Afoot in Mexico

A Visit to the Flower Mountain of Lachiguiri

By Thomas MacDougall

AT the southern end of the most recently inaugurated section of the Pan-American highway in Mexico, south and east from Oaxaca, lies the city of Tehuantepec. Apart from its own peculiar attractions, this town is a very convenient center for field trips.

Settlements of five native races, unexplored rain forest, isolated mountains, extensive coastal lagoons, all are accessible—to the foot traveler. The journey described herewith may be considered a sample of what the region has to offer.

Out of Tehuantepec lies the town of Jalapa, to which there is now daily bus service via the Pan-American highway, plus a few miles of dirt road. This was to be our jumping-off point. For five or six miles out from Tehuantepec the new highway makes a beeline toward the peak of San Pedro, then, beyond Las Tejas river, it winds through the pass between Guiengola and San Pedro to emerge onto the plains beyond.

The large sprawling village of Jalapa has a mixed population, predominantly Zapotec, but Spanish is the language in common use. The wide sand streets are usually dotted with pigs and people in about equal numbers.

Beyond Jalapa one's choice of locomotion is, as it has been for centuries, foot or horseback. The trail runs slightly west of north, parallel with the Rio Grande, and passes through a low-lying irrigated area where corn is grown throughout the year. Three leagues—or three hours—from Jalapa the trail crosses the river. This is an ideal spot to stop for a meal, to rest, or to camp over night on the wide sandy bed. In the quiet of the night, at such a spot, the constellations become intimate. Though the hospitable Jalapeños would readily provide accommodations, and meals, we chose to advance to the Rio Grande crossing, four leagues from Lachiguiri, the first day.

On the morning of the second day a stop was made at the halfway stream, the arroyo Pichancha, for coffee. The cook was my good friend and ideal field companion, Juan Ramirez—Chontal Indian and unofficial custodian (without pay) of the ancient and little known Guiengola ruins.

Beyond here the path becomes increasingly hilly and the last long league before Lachiguiri is a constant twisting climb until, at an altitude of 2,600 feet, a turn into a defile brings a sudden surprising view of Lachiguiri deep in its bowl-like valley, with the mountain looming large behind it. Limited space and the sloping terrain have caused crowding and terracing here, with streets reduced to passageways and stairways. Trees are planted wherever they will grow, and add much to the town's attractiveness. Among the kinds I remember are the mango, avocado, chirimoya, papaya, banana, chico sapote, mamey sapote, coconut, anona, orange, lime, black sapote (*Diospyros* species), CIRUELA (*Spondias* species), ALMENDRA (*Terminalia catappa*), CLAVELLINA (*Bombax* species), and CACALOSUCHIL (*Plumeria* species).

Lachiguiri is purely Zapotec, as is the language spoken. In the direction we have come it is a Zapotec outpost. To the north and to the west lies the "Mijeria," and one may travel for days, in either of these directions, through a country that is solidly Mije in race and language.[1]

The Mountain of Bewitched Jaguars

In Lachiguiri arrangements were made for the morrow, and one Celso was hired for the climb. He had demurred over the prospect of a night on the mountain, alleging danger of "tigres." When Juan made light of these fears, he replied that the jaguar of this mountain *"es el mero* (the real) *tigre nahual."* Nahualism concerns, in part, the belief that the spirit of a person also resides in an animal. A bewitched "tigre" might well be dangerous!

We were to reverse the route taken in 1940, and our procedure, in the light of this and previous visits, was now based in the main on water supply. Celso had brought a cooking pot—a converted gallon can—from his kitchen. I had brought along a cloth for straining. At 5 a.m., by the light of a miner's carbide lamp, we were on our way. Good progress was made and by daylight we reached the last source of regular water supply—a sparkling stream at 4,400 feet altitude. Here a halt was called for breakfast and for a general check-up. Collecting would now be started.

Directly above here *Milla biflora* and other bulbous plants are plentiful. Then, at 5,500 feet altitude, there is a small cave where in 1940 I had found a dwarf begonia growing in the interstices of the limestone walls. The previous collection had become a war casualty and new tubers were wanted now for Rudolf Ziesenhenne, California begonia specialist. I re-entered

---

[1] For a description of this general region, see the article by W. H. Camp in the Journal for July 1937.

View of Lachiguiri, from the "portillo," or south pass, offering a partial view of the Cerro de las Flores. The cloud cap, which is typical of the dry winter season with its prevailing northers, marks the approximate area of the cloud forest in which the author collected. During this period the sky over the plain to the south almost invariably remains cloudless.

with fingers crossed—yes, it was still there, and in greater numbers! In 1940 I had gone in from pure cave curiosity and it was only the few remaining withered leaves that had led to the discovery. Now a good collection was made.[2]

Above this cave there is a series of limestone cliffs and ramps—the most difficult part of the climb. We expected to do considerable reconnoitering

[2]In the January 1948 number of *The Begonian*, Mr. Ziesenhenne describes this new species of *Begonia*, giving it the name *B. cavum*.

The large oak under which the party camped on the first night of the expedition on foot up the Flower Mountain. Celso and Juan are admiring one of the many tillandsias growing as epiphytes on this great tree. Species of *Agave* and *Nolina* are evident. At the extreme right the tips of the fan-shaped leaves of a *Brahea* palm can be seen.

before gaining the relatively gentle slopes of the dome. Detouring here has its compensations, for in addition to the favorably broken terrain, one enters the "cloud cap" zone and with it a new flora. In shaded spots and ledges, growing in humus, are masses of a strong rhizomatous begonia with rounded, deep green, glabrous leaves. On sunny shoulders are colonies of the shrubby, yellow-flowered *Sedum Pringlei*. Two species of *Fuchsia* are in bloom, one of them *F. arborescens*, which in favorable locations develops into beautiful specimens twelve or fifteen feet high and as much in diameter. Above this rocky strip, the glabrous begonia is replaced by another rhizomatous species with large hairy leaves. The three species enumerated, collected within the space of an hour or so, proved to be our begonia bag limit. All were new to me and I believe that only one has been given a name. Some of the less common species of *Begonia* turn up in widely separated habitats but others appear to be restricted in range. The glabrous species mentioned here I later saw, grown as a patio plant, at Tlaxiaco, Oaxaca, so no doubt it grows wild in that region too.

Forest Growth on the Mountainside

With the cliffs behind us we entered a low forest, the sloping floor soft and slippery with deep moist humus and mosses. Two species of dwarf palms form part of the undergrowth. The more abundant—in a genus near *Chamaedorea*—has simple, slender spikes of red fruit. The other is a *Chamaedorea.* On the first trip I had noted its possibilities as a pot plant and now I hoped to find mature seed, but the compact racemes were still green. In their natural habitats one of the attractive features of this group is the abundant fruit, varying from orange to purple-black, according to the species, usually with orange-red rachis. Greenhouse-grown plants seldom show these features to advantage, but they might be duplicated in tropical palmetums. Since 1943, I have collected seed of twenty-three species of *Chamaedorea* in Oaxaca and Chiapas. If one adds to these the species not found in ripe fruit, and the many others I do not yet know, it may readily be seen how rich is the region in species of this genus. All grow readily from seed and make good house plants—even the larger species while they are still young.

The straggling stems of *Sedum Conzattii,* a shrubby succulent, leafless at flowering time, make more or less of a tangle. Small clusters of rich purple flowers are at their tips. To the right is a species of *Mammillaria* bearing a crown of flowers. The sandal worn by the boy whose foot is pointing to these plants is typical native footwear.

Trees growing above the two dwarf palms are numerous. AGUACATE DE FAISÁN, a wild avocado, is brought to notice by the small ripe fruit littering the forest floor. Two species of trees with low dense crowns of lustrous evergreen leaves attracted my attention for their definite ornamental value. Later, E. J. Alexander identified them, from leaves and fruit, as *Gilibertia* species. In the denser growths, especially through thickets in shallow soil, our progress was greatly aided by the paths of tapirs. These paths are wide and are usually well trodden; the occasional tunnels through thick vegetation are low for a man, but the path can always be followed and almost invariably it runs directly up and down hill. A large umbelliferous herb is closely cropped by this strange, secretive, and inoffensive large mammal.

Orchids and Other Epiphytes

Near the top, orchids vie for the center of attraction. Many are "botanicals" whose identity I can only guess at—such as a dwarf species of *Arpophyllum*. The three most spectacular in bloom are *Epidendrum vitellinum*, on trees; *Epidendrum radicans*, terrestrial; and *Isochilus linearis* blanketing rocks with its miniature reed-like stems and purple flowers. At 7,000 feet altitude, where it is alternately bathed in cool, moisture-laden air and warm sunshine, *E. vitellinum* is in its glory. On one fine spike seventeen flowers and buds were counted.

Noteworthy epiphytic companions of the epidendrum are *Echeveria rosea*, *Tillandsia "rubra"*[3] with purple-red bracts, *Tillandsia "imperialis"* with conical inflorescence of rich red, and *Nopalxochia*[4] *Conzattianum*, also

SEEN BY A COLLECTOR ON THE FLOWER MOUNTAIN OF LACHIGUIRI

(*On the opposite page*)

(1) Three species of *Senecio* growing together near the top of the mountain. (2) This *Tillandsia*, measuring about 1½ ft. across, is the one which furnished water for the campers. The inflorescence is not yet fully developed. Suspended beneath the branch on which it was growing is a small flowering plant of *Epidendrum vitellinum*. (3) The curious habitat of a miniature, pink-flowered, tuberous-rooted *Begonia* first discovered in 1940 by the author in this cave at 5,500 ft. altitude and again collected from there in March 1947. The boy is Celso, a native of Lachiguiri. (4) A red-flowered cactus, recently named by Mr. MacDougall, *Nopalxochia Conzattianum*, growing on a branch of a moss-covered oak among plants of *Tillandsia "imperialis"* and species of *Agave*. So far, this cactus is known only from the Flower Mountain. (5) A dwarf palm forest filled with species of *Chamaedorea* at the foot of the "escalera."

[3] Botanical names in quotation marks are tentative identifications of bromeliads made by Dr. Lyman B. Smith from photographs. For identification of succulents, I am similarly indebted to E. J. Alexander.

[4] The middle syllable is pronounced ZOTCH.


1
2
3
5

with red flowers. The latter, which is a species I have only recently described, has great possibilities as a pot plant. It is of botanical interest as the only species of *Nopalxochia* known in the wild. *N. phyllanthoides*—better known as German Empress—the only other member of the genus, has been a popular house plant for more than a century, yet its native habitat is still unknown. I half hoped to find flowering plants of *N. Conzattianum*, but someone had said April, and the rows of small buds now, in March, verified this observation.

Just below the summit now, we threaded our way through a dense stand of young *Cupressus*. Evidently a fire had made a clean sweep of the older trees. The top is so flattened it is necessary to look around to make sure there are no higher levels. The altimeter registers a little over 7,100 feet at this level. Evergreen oaks and pines, in open stands, are the dominant trees here, and heaths—*Vaccinium, Pernettya, Gaultheria*—form a large part of the undergrowth.

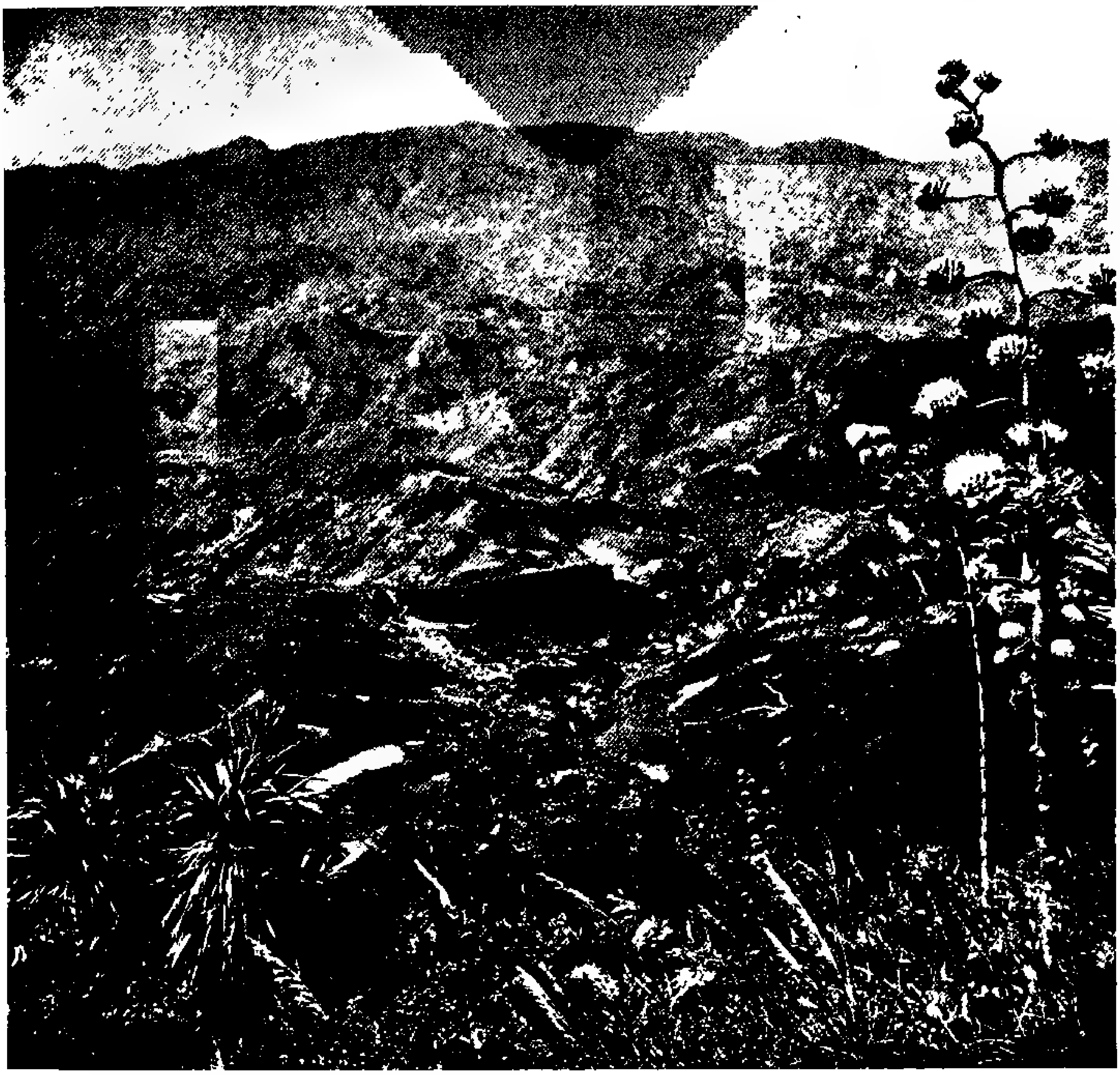
Water Supply from a Large Bromeliad

By this time we were on the look-out for a camp site. The summit was too exposed, but a few hundred feet down the southeast flank, a likely spot was found and we settled under a sheltering oak. With accustomed proficiency Juan soon had a fire going. In the meantime Celso climbed a nearby oak and carefully bent some rosettes of *Tillandsia "imperialis"* over his can. In a short time he returned with a gallon of water. The successful outcome assured us a leisurely stay. Except for floating debris, water like this is quite clear; small frogs, salamanders, and other minute animals that find refuge in bromeliads are mostly forced out when the rosettes become water-filled. A most interesting study might be made of the association of small animals and bromels!

The availability of palatable water is a subject of acute interest to the tropical traveler. Few, if any, of the substitutes are considered the equal of pure water. That of the coconut may be one exception, and the clear limpid sap that may be poured from a freshly cut section of the stem of *Entada* species is perhaps another. That the natives do not appear to make use of this water from bromeliads is partly to be explained by their dislike for "dead water"—they prefer to dip from a stream or a spring; but I have always found it satisfactory.

Our camp site afforded a glorious view and let us look down on the starting point. In Lachiguiri the mountain dominates, and the feeling of its presence is all-pervading. Now we see how Lachiguiri appears to the mountain. To the southwest lies the range (apparently unnamed) that spans the bow of the Rio Grande, between Jalapa and Nejapa. The peak to the left is Cerro Jilote—goal of other field trips. On the ridge, to the left of Cerro Jilote, stands the Mije village of San Pedro Jilotepec. The Pan-American highway is on the far side of the range.

Most of the moist slope epiphytes are abundant around camp, but the



Looking over Lachiguiri with Cerro Jilote, part of an independent range of mountains, rising in the background at the left. A species of *Agave* stands at the right. The view on page 155 was taken from the top of the trail which may be seen entering the valley on the far side.

dominant plants are now those of the drier southern exposure. The more noticeable species in the change include a *Brahea* palm, two species of *Agave,* and a *Nolina.* An *Echeveria,* of the *nodulosa* group, is very common on rocky slopes. *Epidendrum falcatum* drapes vertical rock faces. Above camp, several shrubby species of *Senecio* make splashes of yellow. Toward evening two pairs of green macaws circled us repeatedly, uttering their strident call. Evidently we had pre-empted the roosting site. This species is a denizen of the pine forest. The larger and more gaudy, red, yellow, and blue macaw prefers lower levels. When seen from above, as they fly high over the plains, they present a scene of truly tropical splendor.

At daybreak Celso replenished the tillandsia water for morning coffee. A heavy mist, becoming a fine drizzle, added to the early chill and made the hot beverage most welcome, though the oak and the fire had kept us fairly dry. The night before I had gathered a stock of palm leaves for myself, ostensibly against possible rain, but they were used for bedding—the boys never seek such softness.

Most of the morning was spent collecting and picture taking. Some fifty cuttings of *Nopalxochia Conzattianum* were selected for introduction to

A two-foot specimen of *Tillandsia "rubra"* growing on a fallen log. Its showy bracts are purplish red and the short-lived flowers themselves are of pale lavender, together giving a purplish effect to the entire inflorescence.

growers in the United States. Then a start was made for the return to Lachiguiri.

The south slope, below camp—especially between 6,500 and 5,500 feet altitude—is the habitat of a number of interesting succulents. A massive, silvery-spined *Mammillaria*—the largest I know—and the now leafless dwarf shrub, *Sedum Conzattii,* with flowers of rich purple, the petals tipped greenish-yellow, were there. Growing with them was a *Graptopetalum* closely resembling *G. MacDougallii,* recently named by Mr. Alexander, the type locality of which is Tenango, in the Chontal mountains to the south. A dwarf dormant dahlia later proved to be *D. Merckii.* An *Epiphyllum,* referable now only to something near *E. crenatum,* replaced *Nopalxochia Conzattianum* on oaks.

The changed orchid flora of this drier slope includes *Cattleya citrina* and a *Stanhopea,* the flowers of which later matched those on the fine color plate of *S. Martiana* in "Illustrations of Orchidaceous Plants" by Thomas Moore. The species of Bromeliaceae are also changed and are more numerous. One of the more attractive of those in bloom is *Tillandsia "punctulata,"* the floral heads half red and half green.

In the morning there had been some doubt as to the direction of the ESCALERA (stairway) leading through the cliff formation, but now faint trails began to converge and soon we were zigzagging down the steep path. A tall, few-branched *Echeveria* is common here; this is one of a group represented on many mountains of this region, and whose type seems to be Alexander's *E. carminea* from San Matías Petacaltepec, in the Chontal mountains to the south. To one side of the escalera, at 5,000 feet altitude, is a group of *Nyctocereus,* probably *N. serpentinus,* but flowers are still lacking for proof. As with *Nopalxochia phyllanthoides, Nyctocereus serpentinus* is popular as an ornamental, and it is perhaps equally unknown in the wild. At the foot of the escalera is a fine group of a thicket-forming species of *Chamaedorea,* stooling from the base. Of all I have observed, it is perhaps the species most tolerant of sun and drought.

Below the escalera, pine and oak continued with us. Seed of a tree *Jatropha* was collected—since identified by Dr. P. C. Standley as *J. pseudocurcas*—a new addition to an interesting group in the Euphorbia family. This was our last collection of the trip. Descending, we had now passed below the zone of the flora characteristic of the "Cerro de las Flores."

On the Cover

A view of Lachiguiri showing the church with its towers cracked by earthquakes. The school is at the far side of the square, and the "mercado" or market is the open building at the left, flanked by the "municipio" or town hall. All photographs used with this article are by the author.

Rose-Growers' Day Draws Many Enthusiasts To Botanical Garden in the Rain

MORE than 350 eager rose growers spent the day at the New York Botanical Garden June 10 for the annual program arranged in co-operation with the second district of the American Rose Society. This was the largest crowd in attendance since Rose-Growers' Day was inaugurated in 1943. Shortly after the Garden's own offices were opened in the morning, visitors began to arrive in the Museum Building. By 10:30, when the annual tour of the Rose Garden was scheduled to begin, there was a crowd approaching 200. In another hour, the number was nearly doubled, and it remained at that figure throughout the day. The rain, which started early and lasted until mid-afternoon, apparently kept no one away. The tour of the Rose Garden, under the leadership of Mr. L. C. Bobbink and his associates, took place after 3:30 p.m., with a faint sun attempting to push through the mist. Up to that time, the program was held in the Museum Building. Among those accompanying Mr. Bobbink were his daughter, Mrs. George C. White, his friend, Arthur Herrington, for many years the manager of the International Flower Show, and three members of the staff of Bobbink & Atkins, Robert W. Eisenbrown, Peter J. Kooy and Ludwig Menne.

After a program of motion pictures in the lecture hall, to take the place of the scheduled morning tour, the program for Rose-Growers' Day began with Dr. William J. Robbins introducing Dr. R. C. Allen, Executive Secretary of the American Rose Society, who presided until the noon hour. His place was taken by Professor A. H. MacAndrews of Syracuse University, second district councilor of the Rose Society, who presented George A. Sweetser of Wellesley Hills, Mass., the President, to the audience.

First an informal talk on "Floribunda Roses" was given by Fred Morley of the firm of Jackson & Perkins of Newark, N. Y., originators of this type of rose. Mr. Morley, who himself is a grower of floribundas, pointed to the fact that this class of rose, which came from a cross between a hybrid tea and a polyantha, will endure considerable neglect, and recommended it for people who think that roses will not grow for them. Taking an example from his own garden, he suggested alternating hybrid teas and floribundas in a border, to have bloom all summer long, and he suggested floribundas for hedges, for cut flowers, and to bring color to the planting in front of the house.

Mrs. Richardson Wright spoke on "Roses for the Collector," giving a spirited talk in which she plead for the culture of more species roses and of the old-fashioned types. She named a dozen species and varieties

L. C. Bobbink, veteran rose grower and patron of the New York Botanical Garden's rose garden, with Mr. & Mrs. Richardson Wright (left) and Mr. & Mrs. Edwin de T. Bechtel (right) on Rose-Grower's Day, June 10, 1948.

that would extend the rose season six weeks or more by commencing to bloom in early May. She spoke also of the China roses, calling them a "class of neglected beauties," and of the Bourbons, and she mentioned especially Pemberton's hybrid musk roses. "They are white, buff, and soft salmon," she remarked in describing them, "grow fairly tall, and the flowers are in clusters, with very fine petal texture. They are ever-blooming, and it is a mystery to me why one sees them so infrequently."

After a picnic-style lunch in the Museum Building, the program was continued with an address by Mr. Edwin de T. Bechtel of Bedford, N. Y., a member of the Garden's Board of Managers, on "The Pursuit of the Rose." Mr. Bechtel, who has been pursuing his gardening hobby for many years, spoke of the rose in art, literature, history, legend, economics and horticulture.

To conclude the indoor program, Dr. P. P. Pirone, the Garden's Plant Pathologist, conducted a symposium on rose problems in which questions from the audience were answered by a corps of experts on the stage, including Mr. Sweetser, Dr. MacAndrews, Dr. Allen, Mr. Eisenbrown, Paul F. Frese, Editor of *Flower Grower* magazine and former second district councilor, and Everett A. Piester, Assistant Superintendent of Parks in Hartford, Conn. The questions brought about lively discussions of disease and pest control methods, and of cultural practices.

Breeding For Better Strawberries

By George M. Darrow

SOMETIMES nature takes man by the hand or the scruff of the neck and shows him a better way of doing things. Recently nature has done that to us in our strawberry breeding. We have had projects for larger-fruited, finer-flavored, later-ripening, much firmer-fruited and disease-resistant varieties. Then nature pointed out that we needed, and needed badly, frost-hardy varieties. A cycle of seasons with relatively late spring frosts has occurred and we have had an almost total loss of the strawberry crop for three out of four years. However, we have been testing wild strawberry selections from many regions in our fields, two of them being from North Dakota. These two withstood frosts down to 23° F. when in full bloom and only about 25% of the flowers were killed at 18° F.

How Freezing Temperatures Reduce the Crop

Commercial strawberry growers and gardeners rarely realize the extent of loss due to frosts. The loss is greater in southern than in northern states. The first flowers to open develop into the first ripe berries and also into the biggest berries produced by the plant. In certain varieties, the first flowers to open may have fruit more than twice the size of the next ones, while the third flowers to open develop into fruits only one-third the size of the first ones. Berries of varieties with low-branching clusters do not run down in size so rapidly as those with high-branching clusters. If a frost kills the first flowers that open, the largest and finest berries are lost; if the frost kills the first several flowers, only small berries will be left to ripen. A flower killed by frost will almost immed-

About the Author

Dr. Darrow is Principal Pomologist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture. Among the strawberries which he mentions here, several are his own originations, among them BLAKEMORE, which is now planted on about 34% of the country's strawberry acreage, also FAIRPEAKE, MIDLAND, MASSEY and others. His breeding work also includes the raspberries, blackberries and blueberries, with Dr. W. H. Camp of the New York Botanical Garden co-operating on the blueberry breeding program. Recently the Wilder silver medal was awarded to Dr. Darrow by the American Pomological Society for his leadership in the development of small fruits and the origination of meritorious varieties. Dr. Darrow, who is a native of Vermont, has degrees from Middlebury College and from Cornell and Johns Hopkins Universities. He has been with the U. S. Department of Agriculture for 37 years.

iately develop a black center. Severe frosts may kill even small buds. If the injury occurs when the berry is very small, it is likely to stop enlarging and become a hard, seedy fruit.

Crosses of the two North Dakota wild strawberries with MIDLAND, a large-fruited variety, resulted in seedlings with fruit up to an inch in diameter. All of the seedlings were very frost-resistant, some being about as hardy as the wild parents. These seedlings are still a long way from being commercial varieties, but they do give us hope that in a few generations more we will have home garden and commercial varieties that are frost-hardy.

Prospects in Breeding for Frost Resistance

When the commonly cultivated varieties are compared with more frost-resistant strawberries, the advantage of the hardier flower types as parents can readily be seen, for when BLAKEMORE and MIDLAND, two good commercial varieties, were hit by the temperature of 18 degrees on May 10, 1947, at Beltsville, Md., after several previous nights of 22 and 23 degrees, no flowers remained alive. But of the plants of *Fragaria virginiana* from Fairmount, N. D., 56% of the flowers were still living the morning after, and 82% of those from Sheldon, N. D. Ten percent of the flowers of *F. virginiana* var. *Grayiana* from Louisiana also survived the cold. One selection from a cross of the Sheldon strawberry with MIDLAND came through with 74% alive after the 18-degree temperature late in the season. A large part of the flowers of other MIDLAND hybrids with North Dakotans easily survived low temperatures in late April.

The HOWARD 17 (PREMIER) has been known as the most frost resistant of cultivated varieties. BLAKEMORE, which is a cross of the HOWARD 17 with MISSIONARY, is also slightly frost hardy. Neither, however, can compare with the frost hardiness of these wild strawberries of North Dakota or their hybrids with MIDLAND.

Aiming at More Ascorbic Acid

Another line of work that seems especially promising is breeding for high vitamin C content (4)[1]. First a survey was made of the vitamin C content of the present strawberry varieties in the United States. The average was found to be a little over 60 mg. per 100 grams fresh tissue. The lowest in vitamin C content is the ABERDEEN variety, averaging about 40 mg., while among the highest are CATSKILL, FAIRPEAKE, and GANDY, averaging 80 mg. or above. Berries of a given variety ripening with cool nights and sunny days have the highest vitamin C content, an amount 20 percent or more above that for average conditions and even twice that for unfavorable conditions.

[1] See the list of literature citations at the end of the article.

Because the strawberry has the highest vitamin C content of any widely grown fruit in the United States, it may play an important part in the diet of the American people in certain sections. It has been found that in the country as a whole, but especially in rural areas, the major part of the food consumed is produced relatively locally. If, in a given locality, the foods produced do not furnish sufficient vitamin C, people in that area are apt to be deficient in vitamin C. Frozen and preserved strawberries may retain a large part of their vitamin content so that it is possible for consumers to obtain vitamin C from strawberries the year through.

Both FAIRPEAKE and ABERDEEN have been crossed with selections having a high vitamin C content, and the seedlings exhibited a great range. For example, when ABERDEEN, with its relatively low content of vitamin C, was crossed with U.S. 2153[2], which in 1947 was found to contain 103 mg. of ascorbic acid per 100 grams of fresh tissue, the offspring averaged 69 mg., far above the usual quantity for ABERDEEN. FAIRPEAKE, on the other hand, with an average of 90 mg., provided offspring which dropped the average to 78 mg. when crossed with the high-content U.S. 2153. However, nearly a quarter of these offspring, which include a reciprocal cross, ranked high enough (90 to 129 mg. per 100 grams) to prove that breeding for vitamin C in strawberries was a practical matter. Crossing OREGON 1629[3] with U.S. 2153 proved the point again, for more than half of the plants furnished an average of 90 mg. (In 1943, the average of this hybrid was recorded as 96.) MIDLAND, (86 mg.) however, produced hybrids with U.S. 2153 of which only 18% contained above 90 mg. Nevertheless, the evidence still remains that it is feasible to breed for high vitamin C content, thus increasing the already great value of the strawberry as a source.

Extent of Breeding Program

The seedlings set in the field in 1948 illustrate the types of crosses being made as well as some of the current objectives.

PURPOSE	NO. SEEDLINGS
For resistance to red stele root diseases — Various crosses	690
For flavor — U.S. 2329 x Fairpeake	170
For flavor — Suwannee x Midland	690
For flavor — Fairpeake x Suwannee	2,150
For flavor — Fairpeake x Midland	7,580
For flavor — Fairpeake x N. J. 953	170
For large size — Massey x Midland	1,300
For large size — Eleanor Roosevelt x Massey	2,000
For firmness and freezing — Tenn. Shipper x Midland and reciprocal	2,975

[2] U.S. 2153 = U.S. 261 (Howard Supreme x Klondike) x Fairfax.

[3] Oregon 1629 = Corvallis x Fairfax.

Not all seedlings have been left in the field to fruit. All weak plants and those having the appearance of virus infection have already been dug out; also many showing frost susceptibility of their flowers. From the large number remaining, many selections were expected to be made in May and June, 1948. The 7,580 seedlings of the FAIRPEAKE x MIDLAND cross are the most we have ever grown of one cross for fruiting at one

The ELEANOR ROOSEVELT strawberry variety being crossed with MASSEY pollen to obtain very large-fruited, firm, high-flavored varieties. The sepals, petals, and stamens have been removed from the flower near the end of the brush. The brush has a large amount of pollen on it, which has been collected by brushing it over the anthers on the flower with petals, held above. There are perhaps 300 pistils on the flower being pollinated.

time. We hope to save several hundred. Most seedlings, however, will be discarded because of lack of plant vigor, unproductiveness, too tall fruit stems, fasciation, rough or too dark or too light or too small berries, poor flavor, too acid, hard core, or other specific shortcomings.

Efforts Toward Disease Resistance

Besides the seedlings set directly in the field for fruiting, 46,192 seedlings were grown in the winter in greenhouse benches in soil infested with the red stele root disease (2). In January and February the seedlings were examined and most of them were found to have taken the disease. However, 6,104 were saved, of which 3,791 were considered highly resistant and 2,313 were entirely clean. Of those saved, 4,880 were planted in an infested field near Salisbury, Md., others in a nearby field, in co-operation with the University of Maryland, while 680 were planted at the U. S. Plant Industry Station at Beltsville, Md.

The problem of obtaining red stele resistance is not an easy one. For example, our most successful resistant variety, TEMPLE, has been crossed with the most successful resistant variety of Scotland, where the disease has been especially serious. Among 4,128 seedlings of this cross examined, not a single resistant seedling was found. In contrast, out of 1,150 seedlings of a cross of two of our own highly resistant selections (MARYLAND 683 x U.S. 3374), 326 were saved as highly resistant and 322 as entirely clean, a total of 58% being saved.

Strawberry breeding is carried on in co-operation with the North Carolina State Experiment Station and State Department of Agriculture at Willard, N. C., where this season (1948) 9,000 seedlings were examined and 7,000 more were planted. Likewise, in co-operation with the Oregon Experiment Station at Corvallis, extensive breeding work is under way. Last year some 14,713 seedlings grown there in red stele infested soil in a greenhouse were examined and 2,073 were saved for a field test.

Summary of Purposes in Breeding Strawberries

One aim of breeding is to make the strawberry a more reliable crop for growers. This means, for one thing, breeding for resistance to a disease like red stele root disease, the severity of which has made growing ordinary varieties impossible on thousands of locations. The new TEMPLE and FAIRLAND strawberries are the first results of this work. It also means breeding firmer-fruited varieties that will ship better to market, thus reducing losses in transit and on the grocers' tables. BLAKEMORE, the principal southern variety, was the first one introduced for this purpose. The cross of TENNESSEE SHIPPER X MIDLAND continues this line of breeding. Then, in addition, to reduce loss to growers, the program involves breeding varieties with frost-hardy flowers.

To the consumer, finer flavor always is acceptable. Hence DORSETT, FAIRFAX, NARCISSA, MASSEY, FAIRPEAKE, SUWANNEE and others have been introduced for their superiority. Crosses such as U.S. 2329 x FAIRPEAKE and FAIRPEAKE x SUWANNEE may give us still finer tasting berries.

Larger-sized berries mean lower picking costs, as well as greater ease in preparation — an advantage to both grower and consumer. The MASSEY, now widely cultivated in eastern North Carolina, is nearly 50% larger than the older BLAKEMORE. In North Carolina the cross ELEANOR ROOSEVELT x MASSEY has given us exceptionally large berries which are also good to look at and excellent to eat. This and similar crosses indicate that much larger-fruited varieties can be originated.

Varieties holding their color, shape and flavor after freezing will be welcome to those who freeze berries for their own use.

Many other lines of breeding can be suggested that will make the strawberry a far better fruit.

LITERATURE CITATIONS

1. Darrow, G. M., and D. H. Scott. Breeding for cold hardiness of strawberry flowers. Proc. Amer. Soc. Hort. Sci. **50**: 239-242. 1947.
2. Darrow, G. M., D. H. Scott, G. F. Waldo, W. F. Jeffers, D. P. Ink, and J. B. Demaree. Report for 1946-47 on strawberry breeding for red stele resistance. Trans. Peninsula Hort. Sci. **37**: 13-18. 1947.
3. Darrow, G. M., M. S. Wilcox, D. H. Scott, and M. C. Hutchins. Breeding strawberries for vitamin C. Jour. Heredity **38**: 363-365. 1947.
4. Ezell, B. D., G. M. Darrow, M. S. Wilcox, and D. H. Scott. Ascorbic acid content of strawberries. Food Research **12**: 510-526. 1947.

NOTICES AND REVIEWS OF RECENT BOOKS

Birds, Beasts, Conservation And Philosophy

ADVENTURES WITH A TEXAS NATURALIST. Roy Bedichek. 293 pages, illustrated by Ward Lockwood. Doubleday, Garden City, 1947. $3.50.

Not every naturalist can entertain as well as instruct. In this charming book the author has shown himself to be a master. From many years of experience he has gleaned facts and fancies to beguile his reader.

Mr. Bedichek should not blame us if at times we are doubting Thomases. He condemns the wire fence for causing soil erosion and depletion, whereas we have seen so many hundreds of sections of land ruined through competitive grazing where judicious fencing might have at least delayed the calamity that some of us may question his verdict. Even the Taylor Grazing Act has done little to save the land in parts of Utah, Colorado, New Mexico, and Arizona.

We are skeptical about the roadrunner coping with large rattlesnakes. He doesn't seem to be doing much of a job of it in many places.

When mocking birds peck the eyes out

of rattlers and these in turn sink their fangs into their own flesh, as related by the author's friend . . Oh well, some of us are from Missouri.

After seeing starlings mess up the streets, sidewalks and even the people in Washington, D. C., we are inclined to think the robins he condemns in Austin are really pretty neat little birds.

Our friend argues long to convince us that the mocker does not mock. Even if we think he does we must confess that he takes those stolen notes and renders them as no other bird or beast or man ever has. And we do not think the mocker is a morose and vindictive bird. He is merely a good-natured Irishman who is not happy unless he is fighting.

Mr. Bedichek is an ornithologist, a conservationist of the first water, a naturalist, a mystic and a philosopher. A few quotations may give you an insight into the book and the philosophy of the man. But don't be content with these. Read the book.

"Let us rear a monument to the Unknown Vitamin and place a wreath reverently at its base. Perhaps it lies concealed in the body of the grasshopper or other insect, so securely imprisoned that only the digestive apparatus of the chicken can make it available to man."

"Science which is principally concerned with commercial profit has an awful case of the big-head and has become intolerant of any suggestion coming from the laity."

"The hackberry can't think. It is merely the instrument of something else that does the thinking."

"I have a theory that no one ever goes to nature in the proper mood, patient and receptive, as an earnest student should be, without learning something treasurable. . "

LESLIE N. GOODDING,
Jerome, Arizona.

Text on Ecology

PLANTS AND ENVIRONMENT. R. F. Daubenmire. 424 pages, illustrated, indexed. John Wiley & Sons, New York, 1947. $4.50.

Designed as a textbook by an experienced and capable young teacher and investigator, "Plants and Environment" attains its limited goal in a very satisfactory manner. Although not uninterested in the problems of plant communities and vegetation, Daubenmire is convinced that solutions of such problems will ultimately depend upon information concerning the ecology of the individual kinds of organisms. He therefore leaves to other books the fields of plant sociology and plant geography and concentrates his attention on the environment, the functioning of plants, and the interrelations between plants and their environment. This is ecology, *sensu stricto,* and the type that has the broadest appeal to students in the professional schools who must know about plants in nature.

Daubenmire's book should be easy to teach from and easy to study, for it is well organized and clearly written. The numerous photographic illustrations are all original and well chosen, but sometimes poorly reproduced. The other illustrative material is pertinent. Synecology should be represented by a companion volume to this autecology; and someone, sometime, will write an introductory text for the whole field of geobotany. Students, in the meantime, should not mistake the part for the whole; but if they do, it will not be the fault of the author.

STANLEY A. CAIN,
Cranbrook Institute of Science.

The Scene in Southern Florida Yesterday and Today

THE EVERGLADES: River of Grass. Marjory Stoneman Douglas. 406 pages, indexed, illustrated by Robert Fink. Rinehart, New York, 1947. $3.50.

This is the story of the Everglades and of its inhabitants — plant and animal. Few people are as well qualified to write about this gigantic "River of Grass" which sluggishly flows through southern Florida as is Mrs. Douglas, and she has handled her task with finesse. The result is a charming and fascinating book which accurately delineates the history and past glories of the region, as well as its present radically altered condition.

Though most of the text is occupied with the past of the Everglades, the initial chapter beautifully and glowingly describes the contemporary appearance of this fabulous area. The author has managed to capture the spirit of the 'Glades and has imbued her book with a thrilling and comprehensive cross-sectional study of the entire great area, with the parallel development of its adjacent cities and towns.

Highlights of the book are the beautiful descriptions of the early exploration of southern Florida by the Spaniards and the little known details of the gory Seminole wars. The treatment of the Indians should be read with shame by the American people, and the wholesale exploitation of the region's natural resources should be noted.

Not only is this the story of the Everglades, but it is the story of the whole of South Florida, for the histories of the two are interwoven inseparably. Mrs. Douglas has managed through her adept writing to convert dry historical data into thrilling reality, and has given her volume a charm and readability not often encountered in books of this genre. The numerous superb illustrations in the text by Robert Fink greatly enhance the value of this fascinating study of one of the country's least known areas.

ALEX D. HAWKES.

10,000 *Compounds And Their Biologic Action*

A CATALOGUE OF INSECTICIDES AND FUNGICIDES. Donald E. H. Frear. 203 pages, indexed. Chronica Botanica Co, Waltham, Mass., Stechert-Hafner, New York, 1947. $6.50.

Science needs for its growth an occasional compilation of all the information extant in the various fields. Dr. Frear, Professor of Agricultural and Biological Chemistry of the Pennsylvania State College, has done this job for the field of insecticides in his volume recently published. Frear has already established for himself a worldwide reputation in the field of chemistry of insecticides and fungicides, and his book should add to the luster of that reputation.

It attempts to summarize, in a coded fashion, information on approximately 10,000 insecticides and fungicides. Volume I covers only insecticides.

The first problem that confronted Frear as he attempted to assemble the information was that there was no adequate method of organizing it into such a form that accessions to it could easily be made and information from it could easily be obtained. In co-operation with Dr. C. C. Stock and Dr. E. J. Seiferle, Frear has devised a very complete system for classifying organic chemicals in terms of the active groups such as, for example, the SO_2 or NH_2 groups. He has assigned numbers to all of the various structural entities and structural groups so that the information may be placed on punch cards and sorted.

Frear and his associates pioneered a coding system now being perfected and applied by a committee of the National Research Council, which is interested in codifying the information available on chemicals in relation to all biologic action.

The information in Frear's book for each compound listed is given in the following order: Name (according to the system in Chemical Abstracts), formula, synonyms, organisms against which the compound has been tested, with results, and finally, reference numbers.

The information on toxicity, of course, is pretty incomplete and indefinite, partly because the information on the compounds in the literature is not very good, and partly because it is difficult to condense information on toxicity and still make it useful. Where available, Frear gives the concentration under which the chemicals were tested, thus "HT Sclerotinia, 1%," indicates that the compound when tested in 1% concentration was highly toxic to *Sclerotinia*.

Frear ignores the slope of the dosage-response curve, an excellent measure of assaying the mechanism of toxic action. The fact that slopes are not often given in literature is not a good excuse for ignoring them.

This book is essential for all chemists, entomologists, plant pathologists, and other biologists who are interested in the effect of toxic chemicals on living organisms. We shall look forward to the appearance of Volume II dealing with fungicides.

JAMES G. HORSFALL, *Director, Connecticut Agricultural Experiment Station.*

Short Shorts

THE LITTLE FARMER. Margaret Wise Brown. 36 pages, unnumbered. William R. Scott, New York, 1948. $1.50.

Poster-style pictures in bright colors by Esphyr Slobodkina cover each page completely, with the author's words made a part of each picture. This book is for the very youngest of readers.

ADAM'S HERBS. Marguerite B. Hickernell and Ella W. Brewer. 77 pages, in paper. Herb Lore, Syracuse, 1947. $2.

A book of verses, carrying the story of herbs and their uses from the Garden of Eden, through the Middle Ages, down to the present day with rhymed suggestions for the use of herbs in the modern kitchen. Fanciful drawings have been provided by Prudence Burg.

ROSEMARY AND BRIAR SWEET. William H. Ukers. 44 pages, in paper. Tea & Coffee Trade Journal, New York, 1947. $1.25.

A story of the Boston Tea Party, well authenticated, with a background which includes London and Bristol, England, also China and the India coast, as well as the Massachusetts Colony where the history-making event took place. The tale is enlivened with a sprightly romance. The author, who is editor of the Tea & Coffee Trade Journal, is also author and publisher of two monumental reference works, "All About Tea" and "All About Coffee."

Notes, News, and Comment

Infantile Paralysis Work. Dr. Igor Nicholas Asheshov, formerly of the University of Western Ontario, began work at the New York Botanical Garden June 1, as Bacteriologist in charge of research on the inhibition of bacterial viruses, for which the New York Botanical Garden last year received a grant from the National Foundation for Infantile Paralysis. Announcement of the award was made in the Journal in June 1947. Since then, new laboratories for this research have been in the process of construction in the basement of the Museum building. Dr. Asheshov's work will be concerned with bacterial viruses, in an attempt to find antibiotic substances that will be effective against them. The fundamental work on these viruses, it is hoped, will throw light on the virus of poliomyelitis and suggest approaches for the control of infantile paralysis.

Accompanying Dr. Asheshov are Elizabeth A. Hall and Frieda Strelitz, who were his associates at the University of Western Ontario, where he was Head of the Department of Bacteriology and Immunology of the Faculty of Medicine.

Dr. Asheshov was born and educated in Russia, receiving the diploma of Physician with Distinction from Saratov Imperial University in 1916. He served his internship with the Imperial Army for two years, then spent a year in military hospitals. In 1919 and 1920 he was attached to the British Military Mission in South Russia for experimental work on typhus, and carried out similar research at Salonica, Greece. He then became

Only once IN A GREAT WHILE

are unusual Flowers Like These Introduced

Year after year goes by . . . then comes an exceptional year like this—with more than its share of wonderfully new and unusual flowers . . . such as these:

Fiesta Hybrid Lilies—sparkling colors; in shades of yellow and copper to lacquered red. Totally new.

Pink-Tinted Centifolium—graceful trumpet, white inside with shades of purple to pink showing through.

Golden Chalice Umbellatum Hybrids—these new flowers glow with all the cheerful tones of yellow.

New Strain of Cascade Madonna Lilies—magnificent, purest white. Delightful fragrance.

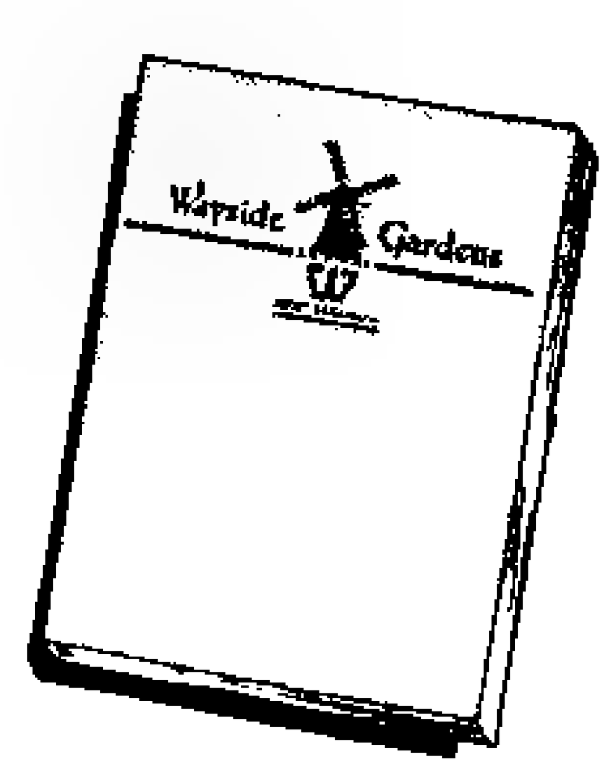
New Dutch Iris National Velvet—falls and standards are deep, rich violet-blue, enhanced by a brilliant golden dot.

New Daffodils—surpassing in size and shapeliness the famous John Evelyn are its hybrids. Duke of Windsor, Leviathan and Brookville are outstanding.

Also: a beautiful collection of new iris and finest oriental poppies (both should be planted soon).

New Tulip Crimson Giant—bigger and more excitingly beautiful than City of Haarlem. A new deep crimson-red. $4 for 25; $13.50 for 100.

Words can't do justice to these glorious flowers and many others to be imported this summer. That's why thousands of flower lovers, every year, send for . . .



World's Finest Book-Catalog on Autumn Planting

Just off the press. 124 pages. Color illustrations as true to life as possible. Cultural instructions. An outstanding reference book on bulbs, roses and flowering shrubs. To be sure that you get your copy, it is necessary that you enclose with your request 50c, coin or stamps, to cover postage and handling costs.

Wayside Gardens

51 MENTOR AVENUE **MENTOR, OHIO**

Director of the State Bacteriological Laboratory at Ragusa, Jugoslavia, where he remained from 1921 to 1928. Then, invited by the Government of British India to take over d'Herelle's research work on cholera bacteriophage, he worked in India from 1928 through 1934. In the meantime he became a British citizen and in 1935 he went to London, England, as Research Officer at the National Institute for Medical Research, to study different aspects of bacteriophage. He also made investigations in this subject at the London School of Hygiene and Tropical Medicine, working with Professor W. W. C. Topley.

From there in 1937 Dr. Asheshov went to the University of Western Ontario, where he was appointed Associate Professor of Bacteriology at the Faculty of Medicine. Five years later he was made head of the department and in 1945 was made a full professor.

Since 1922 he has published nearly 40 papers on bacterial viruses and allied subjects, some of which have been in collaboration with other research workers in India, England and Canada.

Orchid Illustrations. A valuable collection of lantern slides and 5 x 7 glass negatives depicting native orchids has been presented to the New York Botanical Garden by Edward A. Eames of Buffalo. Mr. Eames is co-author with Frank Morris of the volume "Our Wild Orchids" published in 1929 by Scribner, a work which involved 20 years of continuous study and photographing of orchids.

All orchids mentioned in Gray's "Manual of Botany" are included among the negatives, which number about 875. Each one is labeled as to genus and species and where found and photographed. The 400 lantern slides represent the same native orchids. The entire set of negatives and slides is completely catalogued and filed according to genus and species, and securely housed in specially constructed wooden boxes. This is one of the finest collections that has ever come to the Garden.

Gardening Instructor. Substituting for James S. Jack as instructor during the spring in the Garden's class in Outdoor Gardening Practice was Edward S. O'Keefe of White Plains, Superintendent of the estate of Mrs. M. Newborg on Red Oak Lane. Mr. O'Keefe is a 1940 graduate of Cornell University in the Department of Ornamental Horticulture.

Registration in this class was so large that it was necessary to run two sections on separate evenings. The Wednesday class was taught by Joseph W. Tansey, Superintendent of "Uplands" in Mt. Kisco. George Bond, Assistant Foreman in Conservatory Range 1, served as assistant to both instructors.

Visitors. Dr. F. R. Fosberg stopped at the Garden on June 10, on his way from Honolulu to Utrecht where he was a delegate at the symposium on botanical nomenclature and taxonomy starting June 13. Dr. H. W. Rickett and Dr. E. D. Merrill also attended as delegates. From Holland Dr. Fosberg was scheduled to go to France, where he was to represent the Pacific Science Board and the Bernice P. Bishop Museum of Honolulu at a meeting in Paris of the International Committee of Museums.

Among other recent visitors were Kenneth Kopf of the Hawaiian Pineapple Co. in Honolulu, on his way to the International Congress of Genetics in Stockholm; Dr. A. T. Pugsley of the University of Adelaide in South Australia; Efraím Hernandez X. of Mexico City, who has been spending the current year at Harvard; Dr. H. R. Descole, Instituto Lillo, Tucumán, Argentina; C. L. Tenier of the Federal Experiment Station at Lausanne, Switzerland; Mrs. Inez M. Haring and Gladys Baker of Vassar College; Robert W. Schery of the Missouri Botanical Garden, with Mrs. Schery; and F. M. Becton of McKee Jungle Gardens, Vero Beach, Fla.

In April, C. V. Morton of the U. S. National Herbarium spent several days at the Garden investigating ferns.

S. B. Bosa of Carmichael Medical College, Calcutta, India, stopped on his way to Kew in England, where he will carry on a year of special research on antibiotics from Basidiomycetes.

Among others at the garden in spring have been John A. Stevenson, Principal Mycologist of the Bureau of Plant Industry at Beltsville, Md.; Caroline K. Allen, Arnold Arboretum; M. A. Chrysler, Chaplin, Conn.; M. A. Johnson, Rutgers University; Edwin T. Moul, University of Pennsylvania; George B. Rossbach, William and Mary College, with Mrs. Rossbach; W. D. Graddon, Congleton, Cheshire, England; and Alfred T. Quilez of Havana.

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue surface car to Bedford Park Boulevard

Membership in
THE NEW YORK BOTANICAL GARDEN
and what it means

TO THE INSTITUTION, membership means support of a program that reaches several hundreds of thousands of persons annually.

Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

TO THE INDIVIDUAL, membership means, beyond the personal gratification of aiding such a program, these privileges:

Free enrollment in courses up to the amount of the annual membership fee paid.

A subscription to the Journal, to "Through the Garden Gate" and to Addisonia.

Admission to Members' Day programs and use of the Members' Room also at other times.

A share of plants when made available for distribution. (These plants may include the Garden's new introductions into horticulture.)

Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

Business firms may become Industrial Members of the New York Botanical Garden. Information on the classes of Industrial Membership and the privileges of membership will be sent upon request.

* * * *

Classes of membership in the New York Botanical Garden in addition to Industrial Memberships are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
Sustaining Member	25	Fellow for Life	1,000
Garden Club Affiliation	25	Patron	5,000
Fellowship Member	100	Benefactor	25,000

Contributions to the Garden may be deducted from taxable incomes.

Contributions to the Garden are deductible in computing Federal and New York estate taxes.

A legally approved form of bequest is as follows:

I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of*____________________

Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

Vol. 49
No. 584

AUGUST
1948

PAGES
177 — 200

FROM AUGUST ON, AT THE BOTANICAL GARDEN

Midsummer Flower Displays

Waterlilies, both hardy and tropical, including the lotus of East India, in the Conservatory Court

Exotic Tropical Plants, at the main entrance, outside the Conservatory, forming a background for the waterlily pools

Vegetable and Herb Gardens, located near opposite ends of the Conservatory, with a border planting of labeled herbs adjacent to the new Herb Garden.

Pelargoniums (geraniums) of about 100 varieties, near one end of the borders of annuals.

Annual Flowers, 100 or more choice species and varieties, in two borders running the length of the Conservatory.

Rock Garden and Flowering Meadow, east of the Museum Building, open daily from 10 a.m. to 6 p.m.

Courses of Study

Classes in Botany and Gardening will commence at the end of September. A copy of the Educational Program, giving details of all the courses offered, will be mailed free upon request.

Saturday Programs

The autumn series of free Saturday programs will open October 2 at 3 o'clock with a motion picture entitled "The World is Rich." A schedule of the first ten topics and of other events will be sent free upon request.

Other Forthcoming Events

Members' Day programs will be resumed Oct. 6. The annual three-day Chrysanthemum program and show at the New York Botanical Garden is scheduled for Oct. 22—24.

TABLE OF CONTENTS

AUGUST 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription $1.50. Single copies 15 cents.

JOURNAL

of

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VOL. 49 AUGUST 1948 No. 584

The Immortal Botanist

The Strange and Stirring Story of José Celestino Mutis and the Eighteenth Century Botanical Expedition to Colombia in the Time of the Kingdom of New Granada

By Victor Wolfgang von Hagen

THE king was utterly delighted. For once the hang-dog look which Francisco Goya had captured when he painted his sovereign, Carlos III, had disappeared from that face, that unregal face with its sharp-pointed nose and pale-blue intelligent eyes. And the king smiled, actually smiled.

Called betimes by his chamberlain, he had been hurriedly dressed and driven out posthaste to the Royal Botanical Garden, where he had been met with bended knee by Dr. Casimiro Gómez Ortega, the botanist royal. With childish impatience the aged monarch was escorted through the rows of exotic plants brought from the farthest corners of his far-flung empire, and ushered into the director's room; there into his trembling hands were thrust the drawings which had just arrived by courier from his Kingdom of New Granada. They were such as to please even the non-botanical eye: large, beautifully executed drawings of American plants, superbly colored in tints unknown to European herbalists; accurate and wonderful drawings of the tropical flora of the New World. No one had ever seen such botanical drawings, in or outside of the Americas, for their subjects had been arranged with exquisite balance, with a symmetry and perfection of detail that suggested the oriental. They had none of the stiffness of arrangement so current then in European botany, and their grace of drawing was exceeded only by the colors, which were made, so opined the director, by vegetable coloring matter taken from the plants themselves.

With the drawings came a letter dated July 14, 1785, which had been brought from Santa Fé de Bogotá, capital of New Granada (now

Colombia). Dr. José Celestino Mutis, the director of the newly constituted EXPEDICIÓN BOTÁNICA (his obedient servant who kissed the royal hands and feet), begged to report that his "Flora de Bogotá" on which he had labored twenty-some years was, in effect, complete, along with many of its projected five thousand drawings of which the enclosed were a mere sample. At this the king's pleasure was boundless. He who had initiated the greatest era of botanical exploration the world had then ever known, and which was to endure over a half a century with the aid of his successor, was delighted at last to see the fruits of a work on which the State had already advanced such princely sums. The great opus of Mutis with its thousands of superb drawings must be published! And at once! In an imperious gesture, in the manner of "Let there be light and there was light," the king ordered that the great "Flora de Bogotá" be published. And so it was—or rather may be, one hundred and sixty years later.

Now in 1948, almost two centuries since it was begun, there is a strong probability that the "Iconography of the Botanical Expedition of Mutis" is to be published by the Spanish Government. This magnificent work with its wonderful colored plates (which would have been to botany what John James Audubon's "Birds of America" has been to ornithology), has survived climate, earthquakes, revolutions, a thousand and one human foibles, and out of the dust of man's dying is now, at last, to be published.

But the immortal don Celestino has bequeathed to botanical science so formidable a work that its preparation for the press alone will demand the combined talents of many experts and savants. While diplomats split the hairs of protocol at council tables and nations hurl paeans of hate at each other, international co-operation in the realm of science can still rise above the battle. Mutis' work has brought together Ellsworth P. Killip, Head Curator in the Department of Botany at the Smithsonian Institution in Washington, D.C., who assists in the identification of the plants, with Dr. Arturo Caballero, Director of the Jardín Botánica in Madrid, where the original collections are deposited; and they in turn are being helped by Dr. Armand Dugand of the Institute of Natural Science in Bogotá, in the country of origin of the collections, where Mutis lived for forty-seven years. These three scientists, each working in a different milieu, will try to classify approximately 6,900 plates, and will make a selection from among them to illustrate the nearly 2,800 species they represent. Even now, despite the advancements of systematic botany, it is a gigantic undertaking. What a task it must have been in the heyday of Spain two centuries ago! So great the work—so important its place (unfortunately now less to practical botany than to its history) that Mutis became an immortal botanist as was predicted by no less a man than the great Linneaus himself, who wrote of him two hundred years ago, *"Gratulor tibi nomen inmortale quod nulla aetas unquam delebit."*

* * *

THE IMMORTAL BOTANIST AS HE APPEARED TO HIS CHIEF ARTIST

This portrait of Mutis, founder of the intellectual life of the Kingdom of New Granada in the late eighteenth century, hangs today in the Astronomical Observatory in Bogotá. It was painted by Salvador Rizo.

José Celestino Bruno Mutis y Bosio, to give him his full legal and sonorous name, arrived in America in 1761—and in a most sumptuous manner. As personal physician to the new Viceroy of the Kingdom of New Granada—now the Republic of Colombia—he came as part of the retinue that surrounded His Grace, Don Frey Pedro Mesía de la Cerda (or Zerda). Born in Cádiz April 6, 1732, of a distinguished Spanish family which over a period of centuries had given many of its sons to the clergy or the army, Mutis had matriculated at primary schools in his native city, then had gone to the University of Seville, where in 1753 he had been given his baccalaureate. Electing medicine, he studied for four additional years—a remarkably thorough education for the times—after which he took the road to Madrid where in 1757 he received his title of PROTOMEDICO, physician to the royal household. Young Mutis was apparently not entirely satisfied with merely prescribing elixirs. In itself *materia medica* did not hold him, for he was living in the period of the "Enlightenment" when interest in natural science was at fever-heat. Every moment that he could spare from his duties he spent at the recently created Jardín Botánico, where under Barnades he studied botany and dug his nose into Linnaeus' *Systema Naturae*. Then when he could he botanized on the bald mountains of Toledo and Andalucía.

When Carlos III came to the Spanish throne in 1759 he brought more than the three-cornered hat; with the experience that he had had as King of Naples, he implemented the "Enlightenment" and instituted long overdue reforms. He stilled the inquisition and, following the example of France and Portugal, dispelled the Jesuits from America, thus beginning the famous religio-political struggles known as the "Wars of the Seven Reductions." He sought to gain an understanding with Portugal over the territorial disputes which had convulsed all South America, and he became a friend and protector of the arts—leading Francisco Goya on his road to fame; and to his glory he initiated a monumental world-wide program of botanical research (continued by his successor Carlos IV) on which, in time, Spain would expend 400,000 PESOS DUROS, hard pesos, of millions of dollars value. Carlos III was therefore understandably sympathetic to his young doctor's preoccupation with science. But it was not botany alone that animated Mutis; he interested himself also in animals, birds, astronomy, and mathematics. This so impressed the King that he named Mutis as one of those Spaniards who were to continue their studies in Paris, Berlin, Stockholm, at the Government's expense. But Mutis disdained this junket and asked instead that he be allowed to accompany the newly named viceroy to the Kingdom of New Granada.

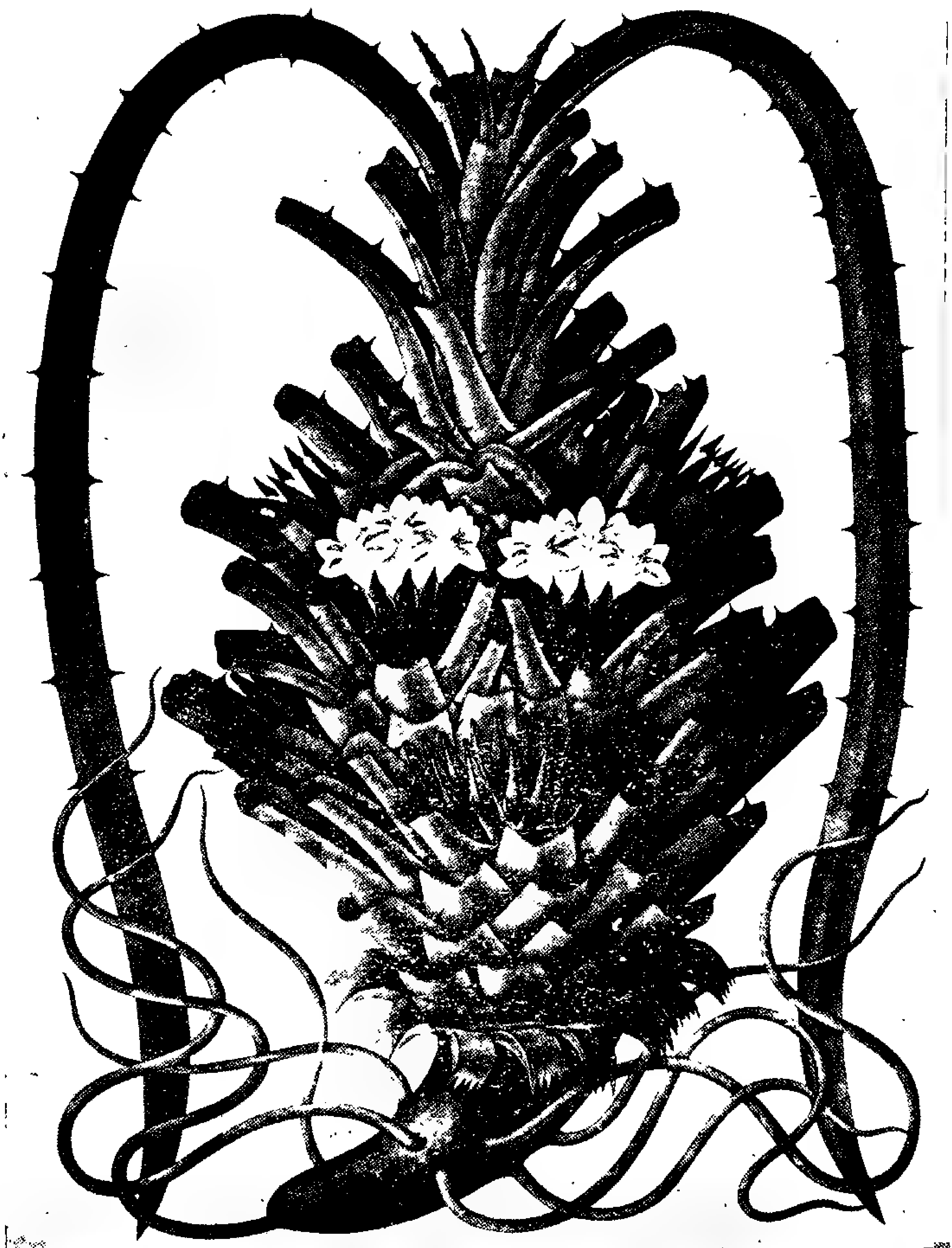
So Mutis left with the viceroy on the man-o'-war *Castilla* on September 7, 1760, bound for South America.

There was excitement in the New World. Although the Spanish had been in possession of the country of El Dorado since 1538, it had changed very little materially, since the conquest. Bogotá then was a small city of 18,000, its inhabitants living in spreading one-storied villas, that frowned on narrow cobblestoned streets. It was the small capital of a great viceroyalty, filled with massive churches attended by legions of monks and deadened by the dry-as-dust learning which priests ladled out as "education." Bogotá was dull and intellectually sterile, with a complete lack of curiosity in the still raw and exciting world about it.

As a physician bringing the latest panaceas from Europe, Mutis was soon overwhelmed with patients, who at first give him little time to botanize; but as time went on and his work became organized, he began collecting plants and soon initiated his memorable correspondence with Linnaeus. By 1762, in addition to teaching Newtonian philosophy, mathematics, and astronomy at the College of San Rosario, he was radically reorganizing the teaching of medicine in the colony. In his fourth American year, on June 20, 1764, he drafted a remarkable letter to his King which was in effect a complete program for botanical and zoological research in the Americas. As he explained to his King the importance of botany in the economy of empire, he lamented the fact that all that the world knew of American botany had come from foreigners—Sloane, Plumier, Brown, Jacquin, Linnaeus and Loefling—and he urged upon his liege that Spain take advantage of its great opportunity. He begged that there be organized a botanical expedition ". . . for the immortal glory of his Majesty," that money be sent him as well as books and equipment so that he might initiate such a program. But Carlos, about to enter war with France against England, was too engrossed with affairs of state, and never answered. Yet Mutis never lost hope. Every year, with almost the precise movements of the equinox, he addressed letters to the King, his Ministers or Viceroys, detailing his new botanical discoveries, and urging upon them the undertaking of a botanical expedition. In the meanwhile, like Pangloss, he cultivated his garden. He also collected plants and continued his correspondence with Linnaeus.

Then after 1766 he disappeared from Bogotá and took up residence in the inaccessible Andes at Pamplona, where for four years (until 1770) he directed the royal mines.

As the years rolled on and the earth responded to revolution, with great alterations in the fabric of the world, change too came to Mutis. Although the passage of time had not altered his enthusiasm, it had altered Mutis the man. He had come to the Americas in the full flood of youth, twenty-eight years of age, tall, well built, with a glow of color on his cheeks. Now the ravages of the tropics were taking their toll; young Mutis had metamorphosed into old Mutis in twenty years that had left their physical mark upon him. Still he had accomplished wonders. Out of his own purse he had developed young botanists, had gathered promising painters from all the far-flung provinces and taught them botanical drawing. He had



A BROMELIAD OF COLOMBIA, DRAWN FOR THE MUTIS "EXPEDITION"

This drawing by Francisco Javier Matiz shows the delicacy of the Matiz technique in handling plants. The leaves of the Bromeliad, which is known as "piñuela," have been cut away to show the blossoms. Reproduced from one of the first proofs of the atlas of 2,800 illustrations that will comprise the "Iconografía de la Expedición Botánica de Mutis." The original proof measures nearly 14 x 19 inches. (Courtesy of the Astronomical Observatory, Bogotá.)

reorganized the teaching of medicine, introduced a whole new curriculum of learning in the colonies, developed modern mining methods, and with the aid of those modern mineralogical Agricolas he had brought to the colonies, he taught the use of PLATINA, the platinum which the colonists had once tossed away as dross; in 1774 he was able to have the King's effigy cast in platinum by Francisco Benito, Master of the Mint in Bogotá. He discovered quinine in the rain-soaked hills beyond Bogotá; he found a bush (*Symplocos Alstonia*) with the taste of tea, which he at once began to cultivate on plantations; he named and systematized the use of IPECACUANHA (*Psychotria emetica*) which one day would enter medical pharmacopoeia as a specific for dysentery; he sought out the famed purple-leafed vine GUACO (*Mikania Guaco*)* which became extensively used as an antivenom. As if all this were not enough, when Catherine the Great wrote her colleague in power, Carlos III, for a dictionary of native American languages to satisfy her royal curiosity, it is to Mutis that the crown turned and he, ever faithful, compiled such a dictionary from the manuscript-vocabularies taken down by the early friars before the Indians were liquidated.

Then suddenly, in 1782, and without prelude—recognition. Things changed with the arrival of the new Viceroy, a portly gentleman, round of belly, merry of eye, a worldly Archbishop weighted down equally with honors and obesity. His name: Antonio Caballero y Góngora. Armed with the temporal power of a Viceroy and the spiritual power of an Archbishop he utterly astounded the SANTAFERENOS with his display of energy. He set to work on the pile of unfinished business left by his predecessor—and in doing so he discovered Mutis. Among the mountains of PAPEL-SELLADO, he unearthed piles of memoranda in the neat script of Mutis, gathering dust and silverfish in the viceregal archives. Góngora immediately sent for Mutis and when he arrived, covered with dust of travel from the far distant Mines of Ibaqué, Góngora was astounded to see him accoutred in the habit of a priest. Mutis confirmed that he was now a priest, having spent so much of his own wealth to develop the riches of New Granada (which was really the business of the crown) that spiritual hunger, as well as the consideration of mere living, had driven him into the arms of the church. Deeply impressed by Mutis the man and stirred by what he had seen and read, the Viceroy immediately constituted Mutis the director of the proposed botanical expedition and gave him orders to employ a staff. By special courier he sent to Spain these proposals with his recommendations. On November 1, 1783, in the *Cajón de España,* Mutis was brought the royal sanctions; at last the King had approved the expedition and Mutis was confirmed as "First Botanist and Astronomer of the Botanical Expedition of Northern America" with 2,000 pesos annually and a budget large enough to employ all the assistants of which he

* *Aristolochia anguicida,* another tropical South American vine, is also used against snake-bite and is also commonly known as GUACO.

had need. Moreover, the treasury was sending him an additional 2,000 doubloons to pay his indebtednesses, and further, the books and instruments which he had ordered were now being collected in Europe. Every detail of the organization that Mutis had planned for twenty years was granted.

He lost no time. Eloy Valenzuela, a learned priest, became his assistant. As an amateur scientist, a Francisan friar, Diego García, was attached to the expedition with three followers, Bruno Landete, Pedro Fermín de Vargas, who became one of Mutis' most valuable men, and José Camblor, who went as geographer. Antonio García and Pedro Caballero were appointed as artists, but García's health forced him early to retire and his place as chief was taken by the famous Salvador Rizo, who was made treasurer also. A young Colombian, Francisco Javier Matis, whom Mutis had discovered sketching flowers in the field, also was taken on as artist. With others he was put instantly to work illustrating the plants of his native country.

To find a quiet place for carrying on his botanical work, Mutis set up headquarters in the ancient town of Mariquita, near the Magdalena river. There, like Epicurus, he built a garden—a botanical garden.

Under the impulse of the expedition the whole of New Granadian intellectual activity quickened, for it was not alone botany that Mutis taught, but every physical science then known to man. Periwigged gentlemen from all the outlying districts brought their sons to the school to place them under Mutis' care. From Quito, famous for its painters, came a whole retinue of limners to work under Salvador Rizo, for the glory of science . . . and for a peso a day, more or less.

The gods of learning were athirst. And even as Mutis was creating a core of learning in New Granada, the King was taking Mutis' plans, enlarging them and making them empire-wide. To Peru in 1778 went the botanical explorers, Ruiz, Pavón and Dombey, where for ten years they suffered the tortures of Tantalus, collecting plants; to Cuba went Boldó; to the high seas in 1789 was despatched the ill-fated expedition of Alessandro Malaspina, equipped with botanists and natural philosophers; to the remote eastern empire of the Philippines went Cuéllar, to Mexico in 1788 went another expedition which, under the inspired enthusiasm of the Spanish botanists, Sessé and Mociño, collected a superb herbarium which was to be published under the title of *Plantae Novae Hispaniae*; while in the Argentine and in the purple lands of Uruguay and Paraguay, Félix de Azara worked for a space of twenty solitary years on the earth-riches of the pampas. It was so formidable an undertaking that it even astounded Humboldt: "No European government," he wrote, "has ever spent more considerable sums to increase the knowledge of plants than the Spanish Government."

Of all this Mutis was the initiator.

(To be continued)

Duboisia in Australia — A New Source Of Hyoscine and Hyoscyamine

By K. Loftus Hills

WHEN Dr. Hills, who is a Senior Research Officer of the Division of Plant Industry of the Australian Council for Scientific and Industrial Research, visited the New York Botanical Garden in the spring of 1947, during the year that he spent in the United States, he told of the recent discovery in Australia of the presence of alkaloids in a native plant, the use of which would offset sea or air sickness. Dr. Hills here tells the story of this discovery and of its development to the point where Australia, almost overnight, has become the world's leading producer of hyoscine and hyoscyamine, two important drugs formerly obtained almost entirely from European sources.

EXTRACTS from alkaloid-bearing plants have been used in treating disease and alleviating pain since the dawn of human history. In spite of the advance made in recent years in the synthesis of natural substances, man is still dependent on plants for many drugs of major importance; and from time to time new plant substances are discovered which have physiological effects that cannot be duplicated in the laboratory. Some alkaloids are known to occur in a number of different plant species and new sources of the economically important drugs are always being sought. During the recent war when the usual sources of many important plant drugs were either in enemy hands or at the end of long and thinly held lines of communication, the search for alternate indigenous or naturalized drug plants was given a new urgency.

This incentive operated to an even greater extent in Australia than in the United States, as the former country was previously almost entirely dependent on overseas supplies of plant drugs and some of the species concerned were neither indigenous nor naturalized. Much of the Australian flora is unique, and although familiar to systematic botanists, its medicinal potentialities are little known.

One plant drug which was in short supply in all the allied countries was the alkaloid, hyoscine. This drug, which in larger doses is beloved by fiction writers as an obscure killing agent, was previously mainly used in association with morphine at childbirth and as an hypnotic agent in certain mental disorders. As the war progressed the demand for hyoscine

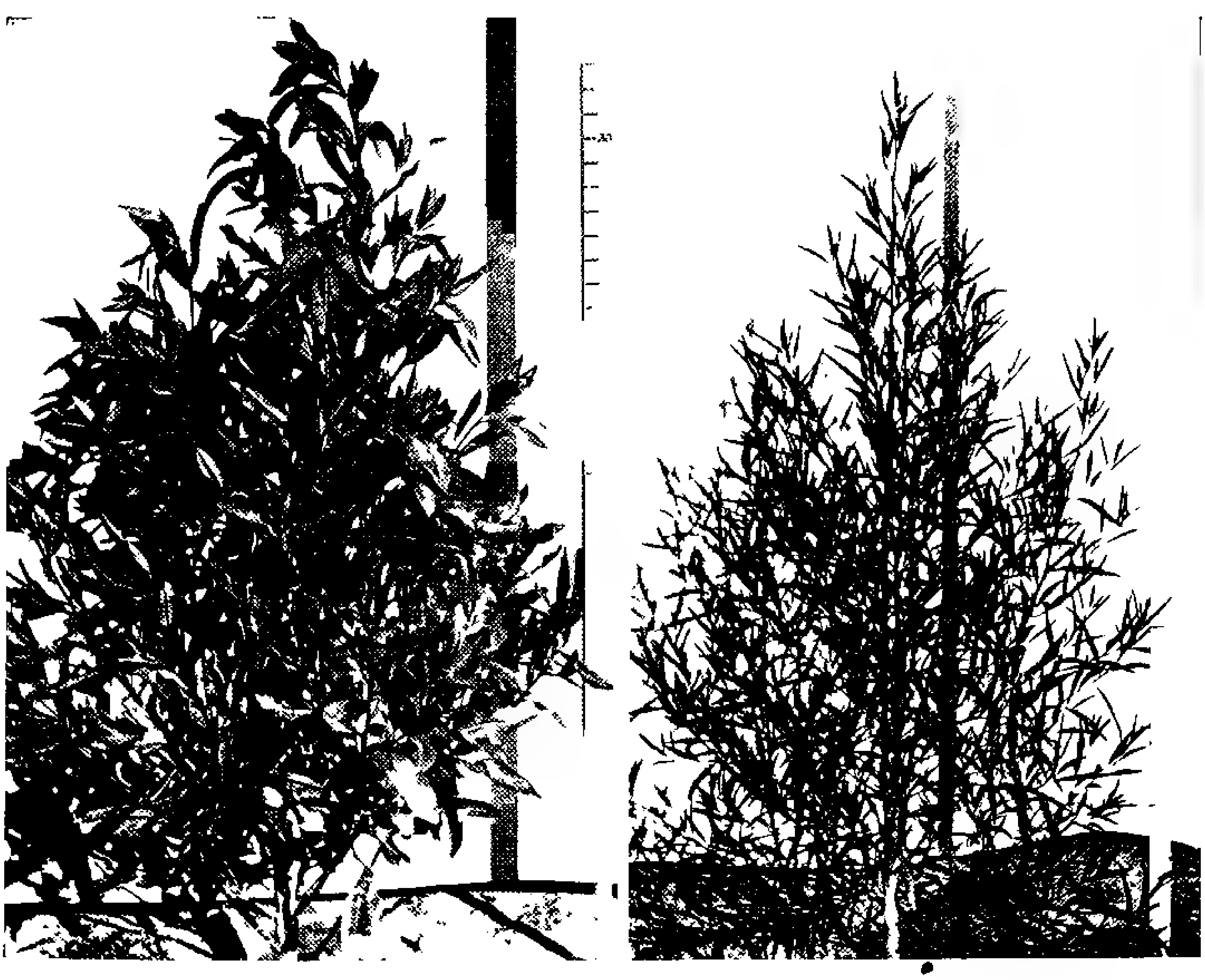
An experimental plantation of *Duboisia myoporoides* in Australia, where this plant is now being grown as a leading source of a group of important alkaloids. The measuring stick is 6 feet high, showing the growth these plants have made in 20 months.

rose to unprecedented levels as it was found to be of great value in the treatment of "bomb shock" and other war neuroses. Extensive experiments made in connection with the problem of motion sickness in seaborne troops revealed that hyoscine was the best drug available for alleviating the condition, and it was used freely from the Normandy invasion onwards.

The small pre-war demand for hyoscine was easily met by reclaiming the alkaloid from the mother liquors after hyoscyamine (the chemical source of atropine) was extracted from the leaves of the belladonna plant (*Atropa Belladonna*), or directly from other species of the Solanaceae, in *Datura* or *Hyoscyamus*, in which it occurred in small amounts. However, practically all the raw plant material had come from the European continent, and this, combined with the increased demand, resulted in an acute supply problem.

It had long been known that the leaves of a tree of the Potato family (Solanaceae), indigenous to Australia and New Caledonia, popularly known as "corkwood" on account of its spongy cork-like bark, and scientifically as *Duboisia myoporoides*, contained a complex of alkaloids with physiological effects similar to those of atropine. As a result of the wartime emergency, interest in the species, as well as in that of a second member of the genus, *D. Leichhardtii*, was re-awakened. The Australian Council for Scientific and Industrial Research, working in co-operation with the Universities of Sydney and Melbourne, began an investigation and discovered that not only did hyoscine occur in the leaves of certain types of both species, but that it did so in concentrations four or five times as great as had been found in any other plant. As a result of intensive laboratory and field tests a commercial firm was soon producing hyoscine in adequate quantities and at a lower price than had previously been thought possible. During the war emergency, more than 7,000 ounces of the drug were produced in Australia from this new source. This is said to exceed the total amount which had previously been produced in the world!

There are only three species of the genus *Duboisia*, none of which occurs beyond Oceania. The third species, *D. Hopwoodii,* is a desert tree confined to the arid interior of the Australian continent which, strangely enough, does not carry the hyoscine-hyoscyamine group of alkaloids, but is rich in nicotine and nor-nicotine. *D. myoporoides* is a subtropical species having a scattered distribution along the eastern coast of Australia, whilst *D. Leichhardtii* is confined to a relatively small section of the south-eastern highlands of Queensland. The latter species in particular is not



Two species of *Duboisia,* 8 months from seed. The one at the left, *D. myoporoides,* from which hyoscine is being derived, has grown 3 feet; at the right is shown *D. Leichhardtii,* source of hyoscyamine, which has grown approximately 4 feet in two-thirds of a year.

plentiful and the wartime demand made such heavy inroads upon the natural stands that at one stage it was feared that it might become extinct. The characteristic of vegetative regeneration after cutting back, which is common to both species, has undoubtedly been one of the principal factors in their preservation. Neither species is strongly competitive and both are readily crowded out by other trees. They have a very scattered distribution and are generally found as isolated trees or small groups in forest clearings or along river banks. In certain areas, plants of *Duboisia* are among the first to establish themselves after forest fires, but they ultimately give way to the more permanent secondary flora.

The species have hitherto only been known in the wild state but successful methods of cultivation have now been devised and there seems no reason why the species should not take their place alongside the regularly cultivated drug plants such as digitalis and belladonna. Although their natural habitat is subtropical, they have shown a wide range of climatic adaptation under experimental conditions and have been found to survive quite severe frosts. Under good conditions seedling trees have been observed to increase in height at the rate of 1 inch per day for periods as long as a month.

The method of cultivation adopted is based on the maintenance of the plants as bushes rather than trees. They appear to maintain their perennial nature when trimmed regularly, and yields on the order of one ton of dry leaf per acre per year have been obtained. Leaf grown under such conditions contains at least as great a quantity of alkaloids as that collected from wild stands.

Selection and testing of different types found within the species has gone forward concurrently with the cultivation trials. Although the genetic-environmental relationships of the alkaloid complex are somewhat involved, it has been possible to isolate types which yield hyoscyamine under any environmental conditions and others which yield hyoscine in most circumstances. In many cases the alkaloids are present together, the proportion of each depending on the environmental conditions and the genetic nature of the material.

The rapid growth of *Duboisia* and its adaptability to cultivation, combined with a very high percentage of alkaloid in the leaves, should insure its becoming the principal world source of hyoscine, and possibly also of hyoscyamine. Seed has been sent from Australia to other countries, including the United States of America, and it is expected that the species will ultimately be cultivated successfully wherever conditions of soil and climate are suitable throughout the world.

Roses For The Collector

As Presented on Rose-Growers' Day, June 10, 1948

By Gertrude Alling Wright

I WAS delighted to be asked to speak on "Roses for the Collector," because as I go about talking on roses and seeing other people's gardens it makes me ache to see over and over again only hybrid teas, floribundas, polyanthas, and a dozen or so well known climbers, when there are so many other beautiful species and varieties. With a moderately careful selection we can have roses from mid-May to late October—that is, if we don't stick to hybrid teas and floribundas exclusively.

Everyone knows *Rosa Hugonis*, but how many plant *R. Primula*, which blooms a week ahead of *Hugonis*, a pale yellow? Then there is *R. xanthina*, which comes a week later—a double yellow as much brighter than *Hugonis* as *Primula* is lighter. On xanthina's heels comes HARISON'S YELLOW. Another fine early yellow is *R. spinosissima hispida* FRUEHLINGSGOLD, with gracefully drooping growth and enormous single yellow flowers. Nor need we confine our early enthusiasm to yellows. *R. spinosissima altaica* is a tall bush filled with big single creamy-white blooms just about the time of *Hugonis*. And a few days later comes *R. acicularis*, a deep pink single. These are all background briars, tall and tough.

There are several lower-growing ones that come early also. *Hibernica* has very deep green little leaves and small, daintily cup-shaped, soft pink blooms. DR. E. M. MILLS has cream-colored cup-shape blooms and grows to three or four feet. Then there is another creamy white to pale yellow rose called PTERAGONIS, which has only recently become available. This is very hardy and not as temperamental as *Hugonis* itself. All these do well as the background of a rose garden, as specimen bushes, or in a shrub border. They really require no care.

The same is true of the rugosas. Many people don't grow *Rosa rugosa* because they don't like the purplish-crimson of the species, but there are some fine colors in the varieties. AGNES has great sprays of blooms almost like hybrid teas. SARAH VAN FLEET is a soft pink which blooms intermittently all through the summer after her spring splurge, and then is fine again in the fall. DR. ECKENER is a deep yellow to orange; BLANC DOUBLE DE COUBERT is a very fragrant double white, and CONRAD MEYER, which goes soaring up ten feet or more, has very large, double, soft-pink blooms. All these and many more are flowering for nearly a month before the hybrid teas get really going.

There are two species which belong in no particular group but are excellent: *R. Moyesii*, said to be the only wild red rose, and *R. rubrifolia*—with insignificant little pink flowers but with striking reddish-mauve foliage.

WHEN Mrs. Richardson Wright concluded her talk on "Roses for the Collector" at Rose-Growers' Day at the New York Botanical Garden June 10, nearly every listener—if comments afterward are any evidence — was eager to grow more of the species and lesser known varieties that she mentioned. Some of her recommendations are given here for interesting roses which demand a minimum of care, yet extend the season of bloom from springtime through late autumn.

There is another class of neglected beauties, the Chinas. They are dwarf like low floribundas. OLD BLUSH MONTHLY is definitely not a cutting rose but it starts about the time of *Hugonis* with a profusion of China-pink blooms and keeps right on like a house afire all summer and all fall. In fact, it is always the last bush to succumb to the frost. It was Thomas Moore's "Last Rose of Summer." COMTESSE DU CAYLA is nasturtium-red, orange-tinted, and fragrant—which is unusual in Chinas. It is especially delicate and graceful and yet hardy.

R. mutabalis, also a China rose, one should have just for the fun of it, for it is unique. The blooms open up sulphur yellow, change to orange, then red, finally crimson, so when it gets really started there are flowers of all those colors at once. WHITE PET is very dwarf and full of pure white tiny blooms all through the season. The Chinas are not as tough as the early species. They require the same attention floribundas ask for.

About the time the hybrid teas start, so do the old garden roses—*centifolia, gallica, damascena, alba* and the Bourbons. In our garden these old dears always steal the show from the modern prima donnas in mid-June. I can mention only a few, but these are outstanding. *R. damascena* is one we get lyrical about every year. It has three-inch single blooms of a glowing rose-pink with a mass of yellow stamens, and one bush will scent up the whole surrounding area. A Damask that draws superlatives from me for its perfection is MME. HARDY, a pure white, very full bloom.

In the gallicas ROSA MUNDI is about the gayest rose I know. It has big semi-double or single blooms of white splashed and striped with cerise, or *vice versa.* It is the oldest known named variety and was known in England and on the continent in the early 16th century. Mrs. Keays says of the gallicas that they are so tough they have to be plowed under to be killed. Another fine gallica is JEANNETTE, a fine rose-pink. But there are at least a dozen or two other good ones. The centifolias are as sweet as the Damask, and from them comes the real rose odor. *R. centifolia cristata* will with no trouble on your part produce whole bushes full of blooms that look like Redouté paintings. Charming as these medium pink blooms are, they are no more charming than the tight bud which is crested like a biretta.

It is often called "Napoleon's cap," though goodness knows he never rated a biretta. PETITE ORLÉANAISE grows to six or eight feet and is literally a mass of very fragrant little double medium-pink flowers.

A moss rose is simply a centifolia which hasn't shaved. The blooms, the plant and its habits are identical. SALET is an excellent pink, so is OLD PINK MOSS.

The species *R. alba* has wonderful blue-green foliage and clear white single blooms of good substance. One of the best varieties is GREAT MAIDEN'S BLUSH, a tall bush with the same fine foliage and very beautiful blush-pink four-inch saucer-shaped flowers. She's an aristocrat among old roses.

These are June blooming roses and as hardy as phlox. They like good treatment but they are obliging when neglected. You will never regret putting a few in the back border of your garden. They can be pruned neatly as you have seen them here or they can sprawl gracefully. They will bloom for a month if you prune some in the fall and some in the spring.

There is just one other group of neglected roses I would like to mention, and that is Pemberton's hybrid musks. They have fine classic names such as PAX, PENELOPE and CLYTEMNESTRA. Occurring in white, buff and soft salmon, with very fine petal texture, the flowers are in clusters and the plants, which grow fairly tall, are ever-blooming. It is a mystery to me why one sees them so infrequently.

I have shown great restraint, for me, in mentioning so few varieties because once I get started I find it most difficult to pick out favorites. It is great fun to pore over Mr. Bobbink's old rose and shrub rose lists. (Needless to say, most of ours have come from him.) I suppose no rose lover will ever be able to thank him adequately for what he has done for us and is doing for us in making available all these utterly delightful and infrequently grown roses.

None of us could become another Josephine with her collection of all the known roses in the world, but anyone of us can make our rose planting infinitely more interesting and can enjoy roses a month to five weeks longer by adding some of these fine species and old garden roses. If you do, I know for a surety that you will never regret it.

Dr. Zimmerman Addresses Graduating Gardeners

SIXTEEN men and women who have successfully completed two years of study at the New York Botanical Garden received their certificates the evening of June 17. The feature of the graduation program, which took place in the Members' Room, was an address by Dr. P. W. Zimmerman of the Boyce Thompson Institute for Plant Research, Inc., of Yonkers, whose subject was "Gardening with a Purpose."

Dr. Zimmerman opened his talk by introducing his theme of acquiring happiness through accomplishment in gardening and by quoting a Chinese proverb which says: "If you wish to be happy for an hour, get drunk. If you wish to be happy for three days, get married. If you wish to be happy for eight days, kill your pig and eat it. But if you wish to be happy forever, become a gardener."

Horticultural Progress

He then told of some of the botanical and horticultural accomplishments which have affected our civilization today, and ventured to predict some of the expected progress of the future. He spoke of the improvement in garden tools and agricultural implements, of the new understanding of the chemical needs of the soil, of the recent work of geneticists in improving plants and in providing dual crops, such as corn and sugar from the same plant or a squash with both flesh and seeds that are edible. He suggested to the graduates that they use their knowledge to carry out experiments of their own, such as making tests of hardiness, improving plants by breeding and selection, attempting to prolong the life of cut flowers and recording all trials and observations carefully. He mentioned some of the aspects of horticulture in which the use of hormones can figure effectively, among them propagation, prevention of pre-harvest drop of fruit, increasing of fruit set, development of seedless fruits, inhibition of buds where growth is not desired, regulation of the time of flowering in order to give long-continued crops, and the killing of weeds. He speculated on the possibility of hormones that would induce new shoots to start, of flower-forming chemicals, and of a method of shaping plants by encouraging and stopping growth at any point desired.

"From our experience with substances which induce roots, modify leaves, and otherwise regulate growth," he said, "it appears evident that all organs of the plant are under some regulating influence, probably of a chemical nature. Once we locate all of these growth regulators, gardening and growing of plants will assume an entirely different trend.

"From the standpoint of horticultural application, progress has been more rapid than in fundamental research. This is because of activities of horticulturists and scientists together. The results have been so spectacular that interest in plant hormones is sweeping the world today. Research in this field holds much for the future and more important applications are sure to be made. Fortunately, we can all take part in some of these activities."

Purposeful Activity

Dr. Zimmerman concluded with an admonition to engage in hobbies with a purpose. "Excel in something," he said, "and you will experience satisfaction — realization, which brings happiness. The *feeling* associated with realization of accomplishments is not for sale; you can't buy it with any amount of riches. It is a by-product of activities, of things done with a purpose.

"All of us are researchers no matter what our jobs, and we must surpass what has already been accomplished to keep ahead. We must search for new and better methods, for even that which we do well must be done better tomorrow."

The Graduates

Four of the men who received certificates in the Two-Year Science Course for Gardeners are employed in the Botanical Garden's horticultural department

— George H. Bond, Assistant Foreman in Range 1; Michael Cangero, Outdoor Foreman; and George Coutras and Julian Finkenstein, gardeners. Others completing the course, which has consisted of classes in General Botany (two terms), Systematic Botany (two terms), Plant Breeding, Ecology and Plant Geography, Plant Pests and Diseases and Economic Botany, are Allen J. Field, Rene Schiffmann,, A. P. Schmidt, and Howard A. Swansen. Mr. Swansen, who is an employee of the State Park Department at Yonkers, also received a certificate in the Two-Year Course in Practical Gardening. Other graduates in this course were Alfred Bailey, Ernest Brothers, Bess Hallock, Alfred LeManna, Edward Lucas, Margaret Sniffen, Edward M. Stein, and Dewhirst W. Wade. Subjects in this course have included Fundamentals of Gardening, Outdoor Flowering Gardening, Outdoor Gardening practice, Cultivation of Trees and Shrubs, Cultivation of Greenhouse Plants, and Indoor Gardening Practice.

Presentation of the certificates was made by Dr. William J. Robbins, assisted by Dr. E. E. Naylor, who has had charge of the courses. A social hour closed the evening.

Notes, News, and Comment

***Neurospora* Research.** Dr. Jesse R. Singleton arrived at the Garden July 1 from the California Institute of Technology, to spend four months in research on a grant-in-aid awarded to Dr. B. O. Dodge by the American Philosophical Society. Following up his work in Dr. G. W. Beadle's laboratory in California, where he was investigating the cytology of the ascus of *Neurospora crassa*, at the New York Botanical Garden he will work on the cytology of the ascus of *N. sitophila* and *N. tetrasperma*, with special reference to the effect of a so-called dominant lethal in *N. tetrasperma*. From the Garden he will go to the University of Missouri as Assistant Professor of Botany.

To Harvard. Dr. Richard A. Howard, who came to the New York Botanical Garden from Harvard University August 1, 1947, as Assistant Curator, returned to Harvard as of July 1, 1948, to become Assistant Professor of Botany there.

Northeastern Meeting. At the summer meeting of the Northeastern section of the Botanical Society of America, in cooperation with four associated organizations, during the week beginning June 14, Dr. W. H. Camp gave an address at New Jersey College for Women on "Disjunct Distributions." Others among the more than fifty botanists from the eastern states and Canada who attended were Dr. H. A. Gleason and his son, Henry Allan Gleason, Jr. Besides the program of lectures and social events in New Brunswick, the meetings included a botanical transect of the state from Port Jervis, N. Y., to Cape May, N. J., with trips to the New Jersey Pine Barrens, to the nearby virgin forest known as Mettler's Woods at Millstone Ridge, and other places of interest.

To Tennessee. Dr. Ilda McVeigh, who has been working on problems of pleomorphism, or the occurrence of more than one form of growth in a plant, in the physiological laboratories, left in June for Cold Spring Harbor, L. I., to undertake some special studies in the laboratories of the L. I. Biological Station. From there in the fall she will go to Vanderbilt University, Nashville, Tenn., where, as Associate Professor, she will do both research and teaching. Dr. McVeigh has been on the Garden's staff as Technical Assistant since September 1, 1945.

Daylilies. Dr. A. B. Stout is the author of a comprehensive article on the Europa daylily, in the July issue of Flower Grower magazine.

Visitors. Dr. J. H. Barnhart came to the Garden June 13 from his home at Southampton, L. I., to spend two weeks working in the library.

Dr. Myron P. Backus, Professor of Botany at the University of Wisconsin, visited the Garden June 30. Dr. Backus worked on a fellowship at the Garden under Dr. B. O. Dodge in 1933. In addition to teaching at Wisconsin, he is now working on new races of *Penicillium* for penicillin production.

Dr. Ivan M. Johnston of the Arnold Arboretum spent several days during June in the library and herbarium.

Among others who have been at the Garden in recent weeks are Edna Kobs of Randolph-Macon Women's College; Mrs. Frances R. Williams, Winchester, Mass., known for her work in drying flowers with borax; Père Teilhard de Chardin of France; Ahmet C. Cayci, Ankara, Turkey; Edgar Kuhlmann of Rio de Janeiro, returning there after a year of study in Montreal; D. Graeme Keith, Cooper Union Museum; Geneva Sayre, Russell Sage College; Janet Wright, Huntington Botanical Garden, San Marino, Calif.; H. A. Gleason, Jr., Hartford Theological Seminary; Edgar G. Rex of the New Jersey Department of Agriculture; Gilbert Marcellus, pharmacist, of New Brunswick, and three former student gardeners now in California — Robert E. Weidner, owner of the Buena Park Nurseries, Peter Dunn, one of his employees, and Herbert L. Bragg of Superior Nurseries, in Los Angeles.

Trustee. On June 21, Dr. William J. Robbins attended a meeting of the trustees of Westbrook Farm, the Bayard Cutting Arboretum, on Long Island, of which he is a member.

Herb Society. Part of the annual meeting of the Herb Society of America which was being held in New York City took place at the New York Botanical Garden June 22. About 75 members attended. The afternoon program consisted of a talk by Dr. William J. Robbins, a visit to the newly planted herb garden near the conservatory and other plantings of interest to the members, and inspection of an exhibit of books in the library concerned with herbs of the Western Hemisphere. Approximately 300 titles were on view. A list of them, compiled by Elizabeth C. Hall, is to be published by the Herb Society.

Officers elected during the business session which preceded the luncheon in the Members' Room are: Mrs. Oliver B Capen, Bedford, N. Y., President; Mrs. Hollis Webster, Lexington, Mass., First Vice-President; Margaret Thomas, Greene, R. I., Second Vice-President; Helen Whitman, Salem Center, N. Y., Recording Secretary; Mrs. Frances Williams, Winchester, Mass., Corresponding Secretary, and Mrs. George Metcalfe, Boston, Mass., Treasurer. Dr. Elmer D. Merrill of Boston serves as president-at-large and adviser to the group. Mrs. Capen, as president of the New York unit, has co-operated with Miss Whitman and Mrs. Mortimer J. Fox in planning the herb garden which has been planted this year at the New York Botanical Garden.

Scholarship. Charles Cabot, a student at Cornell University, is the recipient of a summer scholarship at the New York Botanical Garden, working in the physiological laboratories.

Inspection. Officials of the New York City Park Department visited the Garden July 1 to inspect a new disease of plane trees that has been occurring throughout the city.

Lectures. Dr. P. P. Pirone addressed the Westchester County Horticultural and Agricultural Society at the County Center, White Plains, June 14 on "Control of Rose Insects." Dr. H. N. Moldenke lectured on "Plants of the Bible" to the Garden Club of Somerset Hills, New Jersey, June 16. Dr. E. E. Naylor went to Madison, Conn., June 8 to show the Garden's long color film.

Two Opposing Volumes on Humus And Chemical Fertilizers

HERE are two books representing two schools of thought with respect to the right way of approaching the problem of soil fertility. In some ways their views are diametrically opposed, the one standing for a creed that often amounts to a religion, the other firmly based on scientific experiment, reported fully and without bias.

THE EARTH'S GREEN CARPET. Louise E. Howard, 258 pages, indexed, Rodale Press, Emmaus, Penna., 1947. $3.

The book written by Louise Howard, widow of Sir Albert Howard, is a literary presentation of the views of the Nature (Antichemical) School. The style is picturesque, imaginative, with frequent excursions into the realms of the mystical and metaphysical.

Nature is stated to be the supreme farmer and alchemist; scientist and farmer alike are warned not to ignore her teaching—not to flout her law. The dying down of the green carpet and its renewal is likened to the Buddhist symbol of the revolving wheel—The Wheel of Life—, the analogy to which the reader's attention is constantly directed as the story unfolds.

Soil fertility can be maintained by following Nature's method, namely, the return of all wastes to the land by means of animal and green manuring, composting, supply of water and following Nature's conditions of providing for the soil flora. Moreover, Nature's fertilizers, Lady Howard says, have all been part of a living system, never additions from an alien kingdom such as the NPK*—artificial fertilizers which, according to the theories of this school, induce instead of Nature's slow changes a succession of rapid changes. These, the author of this book claims, stimulate the life of the soil organisms which begin to comb and devour the soil humus.

All the other disastrous effects reported by the Antichemical School such as the killing of the earthworm population, ruination of the mycorrhizal association, destruction of the quality of crops and the modern spread of all types of plant, animal and human diseases, are repeated in this book.

Throughout, the evidence presented is of the general deductive type of reasoning; sound deductions from planned experiments of unquestioned validity are lacking.

CHEMICALS, HUMUS AND THE SOIL. A simple presentation of contemporary knowledge and opinions about fertilizers, manures and soil fertility. Donald P. Hopkins. 358 pages, illustrated, indexed. Chemical Publishing Co., Brooklyn, 1948. $8.50.

The book by Hopkins is the first to present the case for the Orthodox Scientific School. The work is a masterpiece of logical and lucid reasoning in which all the arguments and evidence are carefully assembled and analyzed in a manner easily understandable to the lay reader.

Hopkins points out that we must *not* assume that Nature—with a capital N—is our infallible mistress and immobilize our brains when we seek to court her, for Nature is as often our enemy as our friend. Rather we should accept only logical deductions from well planned and accurate investigations.

Using scientific evidence, Hopkins sees one basic principle evolving, namely, that chemical fertilizers and organic manures (including composts) are *complementary* to each other and that a high cropping level cannot be safely maintained without the combination of chemical fertilizers for NPK* requirements and organic manures for humus maintainence. He adds that it may be possible to maintain fertility with chemical fertilizers alone, by expert handling of humus supply by means of pastures (which he calls *leys*), green manures, catch cropping, and similar practices.

Experimental data are given to show that organic matter of the soil is actually increased by the use of chemical fertilizers, especially of nitrogen, and that the more nitrogen the soil bacteria have, the more humus conversion they will bring about.

That there is no antichemical evidence that stands analysis, in regard to the depression of mycorrhizal fungi, is clearly shown by the data Hopkins presents, nor

*Nitrogen, phosphorus, and potassium—the three most important elements among those required for the maintenance of soil fertility.

is there evidence that these fungi are generally vital to fertility or plant growth.

In like manner, a mass of experimental data are presented to show that the other claims of the Antichemical School, such as the injurious effects of chemical fertilizers on the soil bacteria, on earthworms, on the health of plants, animals and humus, have no foundation. Hopkins notes that all the evidence points the other way.

WALTER THOMAS,
Pennsylvania State College.

MORE BOOK REVIEWS

Primrose Lovers' Manual

THE CULTIVATED SPECIES OF PRIMULA. Walter C. Blasdale. 284 pages, illustrated, indexed. University of California Press, Berkeley and Los Angeles. 1948. $7.50.

Representing more than twenty years of study of the genus *Primula*, this monograph by Dr. Blasdale, Professor of Chemistry, Emeritus, University of California, makes a rare combination of the scientific compilation of material and the enthusiastic attitude of the amateur. The book is valuable both to students of the plant sciences and to those who cultivate the garden primroses, for love of them.

Among the nineteen chapters, three deal with the characteristics of the genus, its biological peculiarities, and horticultural requirements, fifteen deal with the various sections of the genus, such as Vernales, Auricula, Denticulata, Farinosae, etc. with many of the lesser known sections, in the manner of a catalogue of species and varieties, but with an account of the author's own experience with each, thus describing a large percentage of the more than 500 recognized species of the genus. The last chapter deals with the cultivation of the primula in the United States.

As illustrative material there are 8 figures, showing the kinds of primula, the structure of the flower, natural relationships, and classification of sections, seasonal growth cycles, geographic distribution, etc., and there is a map of the "Primula Belt" in Asia. There are also 41 plates, each made up of two or more half-tones, mostly of subjects taken from the author's garden in Berkeley, although a few others are included. There is one color plate, showing *Primula Beesiana.* The index is reasonably complete and the bibliography is especially valuable.

In a subject notably lacking in books, "The Cultivated Species of Primula" becomes a valuable reference book. There is nothing else like it. Every person seriously interested in primroses will want to own it.

ALEITA H. SCOTT.
American Primrose Society.

Looking for Wild Flowers?

WILD FLOWER GUIDE. Edgar T. Wherry. 140 pages, illustrated by Tabea Hofmann. Doubleday, Garden City, New York, 1948. $3.

This is an altogether attractive guide, one undoubtedly destined to be very popular. Unfortunately, though of pocket-size, the book is not bound to stand up under pocket or knapsack conveyance.

It has keys to families, which worked satisfactorily as far as tested in the field, but only the common name of the family appears in the key and there is no page reference to its location in the text. The descriptions of the species are probably adequate if one finds only the plants that are included, nearly 500 in all, but problems may arise if some of the other 1,500 native plants are found. The segregation of introduced but now wild flowers, while useful in its way, is a separation not easily made in the field.

All of the native wild flowers included are illustrated, half of them in color, and about half of the introduced wild flowers are illustrated. Scale of drawing can only be approximated by reading the text,

to which, unfortunately, no reference is made on the plate. The use of scientific names also on the plate would help, considering Dr. Wherry's choice of common names. While we agree with his philosophy, it does take some broad-mindedness, for there are some unnecessary if not undesirable changes, such as Beach Heather to Woolly Gold-heather. In selecting scientific names he is more conservative.

We hold that each author of such a book is entitled to make his own choice of species to include and take the consequences. Personally, we would prefer, where only one or two of several common species are included, as in *Eriocaulon, Pyrola, Utricularia,* and perhaps such as *Aster* and *Solidago,* to identify the genus only. Otherwise the temptation is to force the plant in hand into one or another of the species given, whether it belongs there or not. For example, the species of Bladderwort and Pipewort included would be dangerous and difficult help to one in the New Jersey Pine Barrens bogs.

It was a surprise to find so localized a plant as *Narthecium americanum* included. And it is implied to be common down to South Carolina! If this plant is included, surely one may ask where are *Lachnanthes, Lophiola,* and *Pyxidanthera,* to mention a few genera. Of course, it is no criticism to find a species omitted from a popular wild flower guide, for many must be omitted. We each have our choice.

An appendix lists the included plants in groups according to flower color. Another appendix gives "An outline of plant ecology."

JOHN A. SMALL,
New Jersey College for Women.

Trees of Nine Western States

ROCKY MOUNTAIN TREES, A Handbook of the Native Species with Plates and Distribution Maps. Richard J. Preston, Jr. 365 pages, illustrated, indexed. Iowa State College Press, Ames. Second edition, 1947. $2.50.

The appearance of a second edition of this useful, pocket-size handbook is evidence of its popularity. Covering the Rocky Mountain region in its broadest sense from the Canadian to Mexican borders, this well-illustrated field manual contains nine helpful check lists of the trees found within each state. About 250 species of native and naturalized trees are included in the keys, though nearly half of these, such as less important, small, and local trees, are mentioned briefly without illustration. As in the first edition, the arrangement is two pages to a species. The plate, consisting of drawings of foliage, flowers, fruit, and other details and a small distribution map, conveniently faces the page of descriptive text, which contains additional concise notes on the wood, silvical characters, and habitat.

Minor changes in scientific names have been made in the second edition to conform with nomenclature adopted by the United States Forest Service. Otherwise, the two editions are almost identical and have the same number of pages.

The treatment of the semidesert trees of the Mexican border from western Texas to Arizona does not incorporate the latest available information, especially on ranges, in recently published floras. However, this region with its distinctive flora need not be included in a manual of Rocky Mountain trees.

ELBERT L. LITTLE, JR.,
Forest Service,
U. S. Department of Agriculture.

"America at Work" In One of the Newest Fields

THE PLASTICS INDUSTRY. Josephine Perry. 127 pages, illustrated, indexed. Longmans, Green & Co., New York, 1947. $2.

Josephine Perry's book is a new addition to her series "America at Work." It rounds out the dozen or more volumes produced in the service of popularizing technical knowledge. It is a meritorious undertaking to portray to our future generation of engineers this new creative industry, youthful as the young people to whom the volume speaks in clear language and with attractive illustration.

One could hardly say more in 12 brief chapters to open the minds and eyes of interested people. The first twenty pages of historical introduction lead us from 7,000 years ago to the time when our Dr. Baekeland enters the new field as inventor and creator of the modern synthetic plastics industry.

The book is conveniently divided into chapters on the thermosetting, cellulose, protein and important new plastics followed by sections on methods of molding, fabricating, laminating and finishing of plastics.

For the young reader the author has portrayed these new chemical creations in an appealing and interesting style. For the mature reader it is enriched with a chapter on plastics research and with a cross index of some 400 entries.

Any reader will be inspired to take time to study the book carefully and when he finishes he will not feel tired, thanks to the interesting style of his guide. Our youth to whom the book speaks will find real inspiration to learn more, if not all, about plastics.

This is a good work—well done by Miss Perry and we shall look forward with interest to the next of her exploratory voyages in the rich field of our modern creative industries.

W. D. TURNER.

Earth and its Elements For Building Trees

FOREST SOILS AND FOREST GROWTH. S. A. Wilde, 241 pages, illustrations, bibliography, index. Chronica Botanica Co., Waltham, Mass. Stechert-Hafner, New York, 1946. $5.

This is the first comprehensive text on forest soils in the English language. It appeared almost simultaneously with "Forest Soils" by Harold J. Lutz and Robert F. Chandler, Jr. But the two books are very different both in scope and presentation. Wilde's book is greatly influenced by his Russian-Czechoslovakian background, his long acquaintance with Lake States forest soils conditions, and his special interest in forest nursery problems. Lutz and Chandler's book is a thorough compilation and discussion of literature on forest soils from this country and abroad, made by two authors who both have contributed considerably to the knowledge of forest soils.

Wilde's book deals with the history of the study of forest soils, genesis of forest soils, genetic soil groups of the world, forest cover, physical, chemical and biological properties of forest soils, forest humus, soil-forest types, forest soil survey, soil and tree planting, amelioration of forest soils, silvicultural cuttings in relation to soils, forest management, forest nurseries, use of compost and green manures, nursery fertility and control of parasitic organisms in soils and nurseries.

This is a most valuable contribution to the young science of forest soils.

SVEND O. HEIBERG,
The New York State College of Forestry.

500 *Years of Exploration In South America*

THE GREEN WORLD OF THE NATURALISTS. Victor Wolfgang von Hagen. 392 pages. Greenberg, New York, 1948. $5.

The experiences of twenty-five well known scientific explorers in South America during a period of five hundred years have been brought together in a truly exciting volume by Victor von Hagen.

Brief biographical sketches by the author accompany the carefully selected excerpts from their own writings.

These writings cover a broad field, and are of such variety that each chapter becomes a new adventure for the reader. Particularly interesting are the accounts of the earlier explorers: Oviedo, who published his "Historia Natural y General de las Indias" in 1535, and Friar Gaspar de Carvajal, who writes of the discovery of the Orellano (Amazon) river in 1542.

Down through the centuries came other intrepid men avid for the wonders of this exciting new world: Condamine, Humboldt, Darwin, Henry Walter Bates, and others. There are men still living whose accounts comprise some of the final chapters: Beebe, Murphy, Sanderson.

William Beebe's contribution, "Falling Leaves" taken from his "Jungle Book" is a restful, delicately dramatic gem of writing.

Had the publisher seen fit to include in the book a map of the continent, showing the various regions visited by the explorers, the reader would have benefited.

HELEN M. WOODWARD.

Hydroponics, Revised

SOILLESS GROWTH OF PLANTS. Carleton Ellis & M. W. Swaney. Second edition, revised and enlarged by Tom Eastwood. 277 pages, illustrations, reference list, index. Reinhold, N. Y., 1947. $4.75.

The present edition is essentially a rewrite job. Eastwood has brought together the practical applications that have been made in various installations during the war period. He describes well the details of construction and the techniques of the various types of culture (water, sand, gravel) and evaluates them for particular situations. The details of formulation of various nutrient solutions are compared.

The chapter on plant physiology is sketchy and technical, and, it seems to the reviewer, might have been omitted or else much simplified for the amateur. The language used throughout leans heavily toward the technical, but explanatory material helps in understanding.

It should be a very useful book, especially for those developing a commercial installation. The reviewer regrets that some designation other than "hydroponics" has not been given, because of the commercialized implications.

C. H. Connors,
Rutgers University.

Vistas in San Francisco

GOLDEN GATE: The Park of a Thousand Vistas. Katherine Wilson. 143 pages, illustrated. Caxton Printers, Caldwell, Idaho, 1947. $3.50.

How can anyone write a whole book about a single park? The answer is readily found in Katherine Wilson's story of Golden Gate in San Francisco, in which the narrative is dramatic and the descriptions, accompanied by the author's own delicate pencil sketches, are enticing.

A story to be cherished is of how John McLaren, the superintendent and presiding genius of the park for 53 years, prevented a trolley line from being built across his precious acres by having a crew of men labor all night long to plant trees, shrubs and beds of flowers along the right of way on which work was to start the next day. He had been assured that the track layers would disturb no existing plantings. Knowing the fierce determination of "Uncle John," the promoters abandoned their plans for the trolley and the line was never built.

In her verbal picture of the floral scene in Golden Gate Park, Miss Wilson takes the reader from the rhododendron pageant in May through the year with cherry blossoms, bulbs, eucalyptus, fuchsias, many summer flowers, autumn blooms, berried shrubs, New Zealand tea plants, pittosporums, and escallonias, around to the time of the rich and colorful rhododendrons again.

Carol H. Woodward.

Textbook for Nurses

PRINCIPLES OF MICROBIOLOGY. Francis E. Colien. 498 pages, illustrated, indexed. C. V. Mosby Co., St. Louis. Second edition, 1946. $3.50.

This textbook for students of nursing covers the usual material on medical bacteriology. In view of the limitation to organisms of sanitary or medical importance, it is difficult to understand the use in the title of the inclusive term "microbiology." The severely practical level of the discussion might also lead the captious to question the use of the word "principles" in the title.

For this reviewer, the merits of this elementary text, insofar as organization and content are concerned, are overshadowed by the fantastically poor quality of the half-tone illustrations. The photomicrograph on page 380, for example, which purports to be of *Aspergillus,* would not be recognized as such by many professional mycologists. Again, the photomicrograph of *Clostridium perfringens* on page 334 is so hazy that no conclusion can be drawn about the organism apart from its rod shape. In fact, no half-tone illustration is clear. This poor reproduction is undoubtedly the fault of the paper used in this printing, not of the original photographs, but the effect is the same—bacteriology viewed through a glass, darkly. The lack is only in part made up by the inclusion of twenty-five colored plates of generally good quality. For the elementary student there is no substitute for an abundance of good illustrations.

Vincent W. Cochrane,
Wesleyan University,
Middletown, Conn.

Fabulous Tale of Textile Source

HERITAGE OF COTTON. M. D. C. Crawford, 294 pages, illustrated, indexed. Fairchild Publishing Co., New York, 1948. $3.

Here is told the fabulous story of cotton—the delicate seed-hair of nature, the great American agricultural staple. Every page is fascinating reading for those who appreciate our final and irrevocable dependence on nature as a support of our national economy.

Bernice S. Bronner, *Secretary,*
American Assn. Textile Technologists.

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue surface car to Bedford Park Boulevard

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

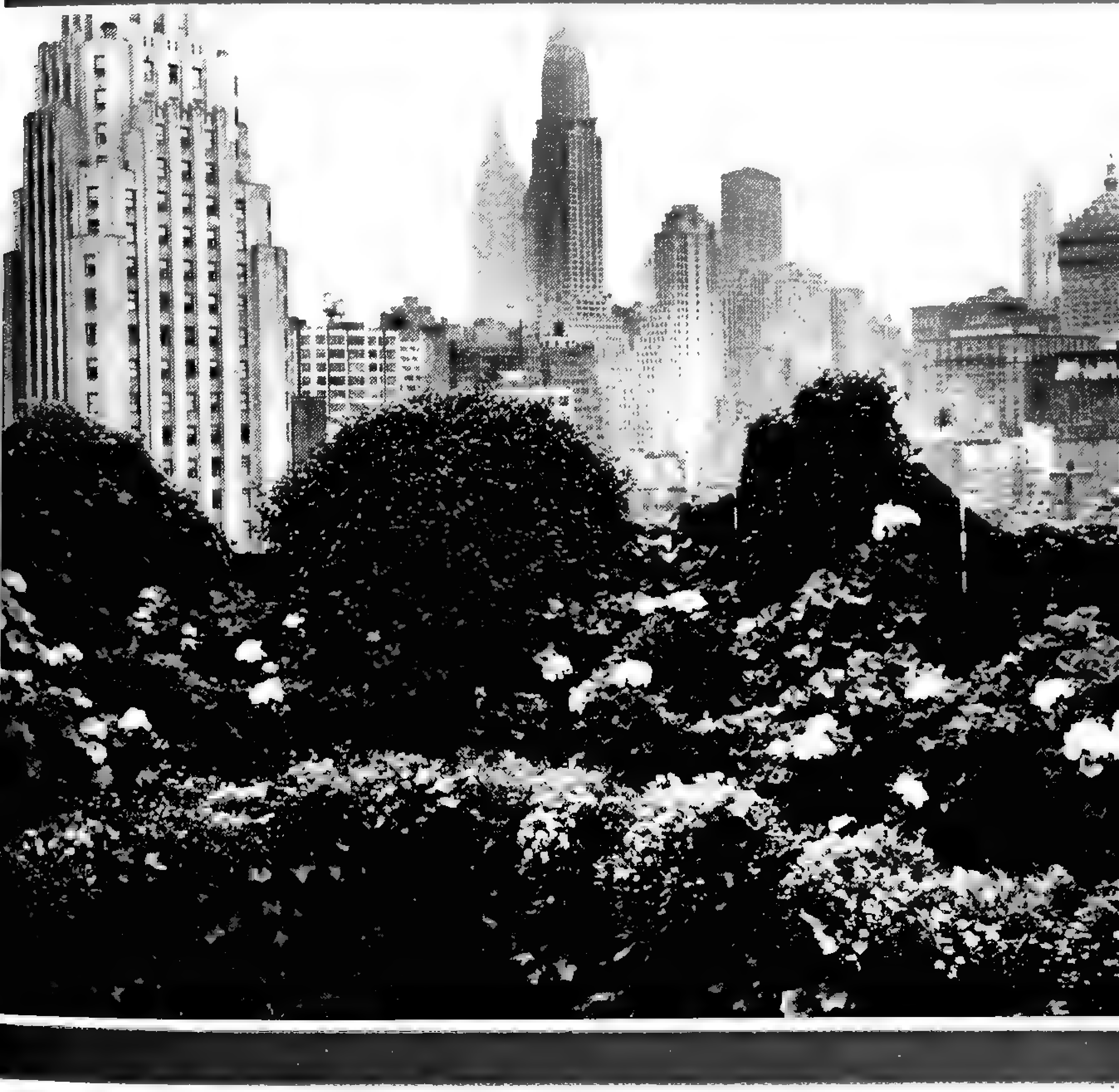
The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs. Elon Huntington Hooker, First Vice-Chairman; Mrs. Richard de Wolfe Brixey, Second Vice-Chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Guthrie Shaw, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

Arthur M. Anderson
Mrs. Arthur M. Anderson
Mrs. George Arents, Jr.
George Arents, Jr.
E. C. Auchter
Mrs. Elliott Averett
Dr. Raymond F. Bacon
Prof. L. H. Bailey
Stephen Baker
Sherman Baldwin
Charles W. Ballard
William Felton Barrett
Mrs. William Felton Barrett
Howard Bayne
Edwin De T. Bechtel
William B. Bell
Prof. Charles P. Berkey
Prof. Marston T. Bogert
Prof. William J. Bonisteel
Mrs. James Cox Brady
George P. Brett
Mrs. Richard de Wolfe Brixey
Leonard J. Buck
Mrs. Charles Burlingham
Miss Mabel Choate
Miss E. Mabel Clark
W. R. Coe
Mrs. Jerome W. Coombs
Mrs Henry S. Fenimore Cooper
Mrs. William Redmond Cross
Mrs. C. I. DeBevoise
Mrs. Thomas M. Debevoise
Mrs. Sidney G. de Kay
Edward C. Delafield
Mrs. John Ross Delafield
Julian F. Detmer
Mrs. Charles D. Dickey
Mrs. Charles Doscher
Mrs. Walter Douglas
Mrs. John W. Draper
Henry F. du Pont
Mrs Moses W. Faitoute
William B. O. Field
Mrs. Robert H Fife
Mrs. Reginald Fincke
Harry Harkness Flagler
Mrs. Mortimer J. Fox
Childs Frick
Rev. Robert I. Gannon, S.J.
Dr. H. A. Gleason
Mrs. Frederick A. Godley
Charles B. Harding
Mrs. Montgomery Hare
Mrs. William F. Hencken
Mrs. A. Barton Hepburn
Mrs. Elon H. Hooker
Mrs. Clement Houghton
Mrs. Roy A Hunt
Archer M. Huntington
Mrs. O'Donnell Iselin
Pierre Jay
Mrs. Walter Jennings
Mrs. Alfred G. Kay
Mrs. F. Leonard Kellogg
Mrs. Warren Kinney
Mrs. Lee Krauss
H. R. Kunhardt, Jr.
Mrs. Albert D. Lasker
Mrs. Barent Lefferts
Clarence McK. Lewis
Mrs. William A. Lockwood
Dr. D. T. MacDougal
Mrs. James C. Mackenzie
Mrs. David Ives Mackie
Parker McCollester
Miss Mildred McCormick
Louis E. McFadden
Dr. E. D. Merrill
John L. Merrill
Roswell Miller, Jr.
S. P. Miller
George M. Moffett
H. de la Montagne
Col. Robert H. Montgomery
Mrs. Robert H. Montgomery
Barrington Moore
Mrs. William H. Moore
B. Y. Morrison
Frederick S. Moseley, Jr.
Mrs. Augustus G. Paine
Mrs. James R. Parsons
Rufus L. Patterson
Mrs. Wheeler H. Peckham
Mrs. George W. Perkins
Mrs. Hugh Peters
Howard Phipps
Rutherford Platt
Francis E. Powell, Jr.
Mrs. Harold I. Pratt
Mrs. Rodney Procter
Mrs. Joseph M. Proskauer
Mrs. Henry St. C. Putnam
Mrs. Grafton H. Pyne
Lady Ramsey
Stanley G. Ranger
Johnston L. Redmond
Prof. Marcus M. Rhoades
Mrs. Junius A. Richards
Dr. William J. Robbins
Mrs. Melvin E. Sawin
John M. Schiff
Mrs. Henry F. Schwarz
Mrs. Arthur Hoyt Scott
Mrs. Arthur H. Scribner
Mrs. Townsend Scudder
Mrs. Samuel Seabury
Mrs. Guthrie Shaw
Prof. Edmund W. Sinnott
Mrs. Samuel Sloan
Edgar B. Stern
Chauncey Stillman
Nathan Straus
Mrs. Theron G. Strong
Mrs. Arthur H. Sulzberger
Joseph R. Swan
Mrs. Joseph R. Swan
Mrs. Thomas D. Thacher
Mr. Oakleigh L. Thorne
Prof. Sam F. Trelease
Arthur S. Vernay
Mrs. Antonie P. Voislawsky
Manfred Wahl
Allen Wardwell
Nelson M. Wells
Alain C. White
Mrs. Nelson B. Williams
John C. Wister
Richardson Wright

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN



Vol. 49
No. 585

SEPTEMBER
1948

PAGES
201 - 224

AUTUMN EVENTS AT THE GARDEN

Courses of Study

Field Botany	
Autumn term	Seven sessions, Saturday afternoons, 1:30 - 3 p.m.
Sept. 11 - Oct. 23	Instructor: *G. L. Wittrock* $5 ($2.50 to teachers)
Nature Study for Teachers	
Autumn term	Fifteen sessions, Wednesday afternoons, 4 - 6 p.m.
Sept. 15 - Dec. 22	Instructor: *Dr. E. E. Naylor* $10 ($5 to teachers)
Two-Year Science Course for Gardeners	
Plant Pests & Diseases	Twelve sessions, Monday evenings, 8 - 9 p.m.
Sept. 27 - Dec. 13	Instructor: *Dr. P. P. Pirone* $10
Soils & Fertilizers	Twelve sessions, Monday evenings, 9 - 10 p.m.
Sept. 27 - Dec. 13	Instructor: *Dr. F. W. Kavanagh* $10
Two-Year Course in Practical Gardening	
Cultivation of Trees & Shrubs	Six sessions, alternate Thursdays, 8 - 10 p.m.
Sept. 30 - Dec. 16	Instructor: *J. H. Beale* $10
Designing the Home Grounds	
Autumn term	Five sessions, Thursday afternoons, 3 - 5 p.m.
Oct. 7 - Nov. 4	Instructor: *Alice L. Dustan* $7.50

Free Saturday Programs

3 p.m. in the Lecture Hall

Oct. 2	***A Gardener's Tour of the U.S.A.***	*Alice L. Dustan* Landscape Designer
Oct. 9	***Mushroom Collecting as a Hobby***	*Donald P. Rogers* Curator
Oct. 16	***The World is Rich***—A motion picture film	
Oct. 23	***Thatched Roofs and How They are Made***	*Albert J. Irving* Men's Garden Club

Members' Day Program

3 p.m. in the Members' Room

Oct. 6 ***"Insurance" For Your Plants*** — *P. P. Pirone*, Plant Pathologist

Chrysanthemum Show and Program

Oct. 22 - 24 in the Museum Building and Outdoors

The Annual Chrysanthemum Show and Program presented in co-operation with the National Chrysanthemum Society will include an indoor display of chrysanthemums to be staged by the Society and a program to be presented Friday afternoon in the Lecture Hall by the New York Botanical Garden. The museum building will be open for the public to view the displays Friday afternoon and all day Saturday and Sunday. Admission will be free. Near the Conservatory, the outdoor borders of hardy chrysanthemums will be on view daily until half an hour after sunset, throughout that period of the month. Bordering the path between the Museum and the Conservatory there is a trial border of new varieties of chrysanthemums for inspection. A detailed program for the three-day event will be mailed by the New York Botanical Garden upon request. Information concerning the competitive exhibits may be obtained from Carl Toepler, 86 Van Buren Ave., Teaneck, N. J.

* * * * *

TABLE OF CONTENTS

SEPTEMBER 1948

JOURNAL

of

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VOL. 49 SEPTEMBER 1948 No. 585

How Metasequoia, The "Living Fossil" Was Discovered In China

By H. H. Hu, Director
Fan Memorial Institute of Biology
Peiping, China

CHINA has the richest temperate flora in the world. Since the mesozoic age a large portion of China has never been submerged by the transgressing sea; and during the glacial period, glaciation has been little developed in China; again there have been in China no insurmountable barriers, such as a large body of water like the Mediterranean sea or a great desert like the Sahara, which prevent plant migration back and forth during the glacial and interglacial periods.

All these factors contribute to the origin and survival in China of numerous interesting flowering plants, both gymnosperms and angiosperms, especially in the southwestern and upper Yangtze provinces, such as western Hupeh, Szechuan, Yunnan, Kweichow, Kwangsi and Kwangtung provinces. Among the interesting Chinese genera of trees, *Ginkgo* was the most famous and was first rightly called the "living fossil." But there are many other "living fossils" among Chinese trees, such as *Pseudolarix, Keteleeria, Amentotaxus, Glyptostrobus, Cunninghamia, Cephalotaxus,* and *Libocedrus,* among the gymnosperms and *Cercidiphyllum, Liriodendron, Petrophiloides* (*Platycarya*), *Sassafras, Nyssa,* and many others among the angiosperms, which have been discovered in fossil conditions in Europe or North America from very ancient geological times. Other genera of Chinese trees, such as *Taiwania* and *Fokienia* among the gymnosperms and *Rhoiptelea, Eucommia, Tetracentron, Euptelea, Trochodendron,* etc., among the angiosperms, may be discovered some day in fossil conditions also. Only the most striking relics are called "living fossils." Among these the latest and the most interesting is the *Metasequoia* discovered in 1941 in Wan Hsien of Szechuan province.

In the winter of 1941 Professor T. Kan of the Department of Forestry of the National Central University journeyed from Hupeh to Szechuan, and saw on the roadside at Mou-tao-chi in Wan Hsien a large deciduous tree which was called by the natives SHUI-SA or water fir. This attracted the attention of Professor Kan. Unfortunately no specimens were collected at that time as all the leaves had fallen off. Next year Professor Kan requested Mr. Lung-hsin Yang, the principal of the Agricultural High School, to collect herbarium specimens for him. But these were not identified. In the summer of 1944 Mr. T. Wang, a staff member of the Central Bureau of Forest Research, went to western Hupeh to explore the forests at Shen-lung-chia, and was asked by Mr. Lung-hsin Yang to go to western Hupeh by way of Wan Hsien and Enshi in order to investigate the SHUI-SA at Mou-tao-chi.

At Mou-tao-chi Mr. Wang collected herbarium specimens of leafy branches and fruits of this tree and thought it to be *Glyptostrobus pensilis* Koch, or SHUI-SUNG, the water pine, which is a common deciduous coniferous tree in Kwangtung province found also in Kiangsi. Mr. Chung-lung Wu, an assistant in the department of forestry of the National Central University, met Mr. Wang, who gave him a branchlet of the water fir with two cones. Mr. Wu presented these to Professor W. C. Cheng of the same department, who considered this tree not a *Glyptostrobus* but a new genus, on account of the opposite character of the peltate fruiting scales, which differ from those of *Glyptostrobus,* although the deciduous linear leaves are somewhat similar.

Professor Cheng then sent his assistant, Mr. C. Y. Hsieh, to go twice to Mou-tao-chi in February and May 1946 and these trips resulted in the collection of specimens of flowers and young fruits of this water fir, from which Professor Cheng understood the morphology of this tree more clearly. In the autumn of the same year Professor Cheng sent to me fragments of herbarium specimens Mr. Hsieh collected and asked my opinion about this new genus, which he thought to be closely allied to the American genera *Sequoia* and *Sequoiadendron,* the California coastal redwood and the famous big tree.

It happened that I had a reprint of a paper by a Japanese paleobotanist, Mr. S. Miki, instructor in Kyoto University, entitled "On the Change of Flora in Eastern Asia since Tertiary Period," in which he proposed the new generic name *Metasequoia,* based on two fossil species which were formerly known as *Sequoia disticha* Heer and *Sequoia japonica* Endo, both found from the pliocene beds near Tokyo. He found his new genus *Metasequoia* differing from the true *Sequoia* in the long stalk and in the opposite scales of the fruits. I had on hand also a paper by another Japanese paleobotanist, Professor S. Endo, entitled "A New Palaeogene Species of *Sequoia,*" in which he published a new species, *Sequoia chinensis* Endo, from eocene beds in Fushun coal mines in southern Manchuria and

Kawakami coal mines in southern Saghalien. This I found to be also a species of *Metasequoia*. Thus I published a paper in the Bulletin of the Geological Society of China, Vol. 26, 1946, entitled "Notes on a Palaeogene Species of *Metasequoia* in China," in which I transferred *Sequoia chinensis* Endo to the genus *Metasequoia* and announced the discovery of a living species of this remarkable tree in Wan Hsien of Szechuan province.

I then communicated with Professor Ralph W. Chaney of the Department of Paleontology of the University of California, who had not seen either Miki's or Endo's paper. On the basis of the descriptions I supplied to him, Professor Chaney found that *Sequoia macrolepis* Heer, *S. fastigiata* Sternberg, *S. concinna* Heer, *S. Langsdorfii* Heer, *S. Nordenskioldi* Heer, *S. Reichenbachii* Heer, and *S. Heerii* Lesquereux all belonged to this new genus *Metasequoia*. He considered the discovery of this living *Metasequoia* the most interesting in botany in a century.

After Mr. Hsieh made the collection of herbarium specimens Professor Cheng sent a specimen to Dr. E. D. Merrill for examination. I wrote to Dr. Merrill telling him my identification of this new tree to the fossil genus *Metasequoia* and requested him to send $250 to enable Mr. Hsieh to go to Szechuan to collect seeds. Dr. Merrill sent the money and Mr. Hsieh flew to Chunking in the autumn of 1947 and then went to Mou-tao-

One of the Garden's seedlings of the recently discovered "living fossil" tree in China, *Metasequoia glyptostrobioides*, a deciduous conifer.

chi where he collected large quantities of seeds, which Professor Cheng sent to Dr. Merrill, who distributed them to 76 institutions and persons interested in trees for propagation purposes. I also distributed these seeds to a few institutions and persons abroad, and many important institutions of botany and forestry in China have been given seeds also for propagation purposes.

Last winter Professor Chaney wrote to me expressing his wish to visit the *Metasequoia* region to make personal investigations. Early in February this year Professor Chaney flew to Nanking and with Mr. Hsieh both flew to Chunking, from where they journeyed to Mou-tao-chi and Shui-sa-pa in Lichuan Hsien of Hupeh province. In these bandit-infested regions they explored for three weeks and took photographs and wood-borings and collected herbarium specimens of plants associated with this tree. I met Professor Chaney in Nanking in the latter part of March. We discussed the phylogeny of *Metasequoia* and *Sequoia*, and the relationship between the families Metasequoiaceae, Taxodiaceae and Cupressaceae. At the same time we started the movement to establish a committee in the Chinese government for the conservation of *Metasequoia,* which is on the verge of extinction as there are found no more than 1,000 large and small trees of this living fossil in existence, and the peasants are still cutting the trees for interior finishing purposes. Now such a committee has been established, the ministries of interior, education and agriculture, the Academia Sinica, the National Central Museum and the Fan Memorial Institute of Biology all have representatives to participate in this work, looking forward to the establishment of a Metasequoia National Park in the type region. Professor Chaney was appointed a foreign member of this committee. Professors Merrill and Chaney have jointly made an appeal to subscribe money for this purpose.

METASEQUOIA, THE WORLD'S NEWEST "LIVING FOSSIL", IN ITS NATIVE HABITAT

(*On the opposite page*)

Upper left, one of the first of the trees to be discovered in China, near Mou-tao-chi, Szechuan, in February, when it was leafless. The two smaller trees on the bank in the foreground are also specimens of *Metasequoia. At the right,* the large Metasequoia of the accompanying picture in its summer dress. *Lower left,* three specimens of the newly discovered deciduous conifer at Shui-sa-pa, Hupeh. These are the three straight trees of varying height at the left of center, with figures standing at their left. Farther to the left are trees of *Cunninghamia.* At the right are chestnuts and bamboos. *Lower right,* the landlord of the property where the second lot of *Metasequoia* trees was discovered, stands beside the trunk of the largest tree in the picture at the left, with his children. The three larger photographs opposite are from Dr. Ralph W. Chaney, who visited the site of these famous trees last year. The small picture showing the *Metasequoia* in full leaf comes from the author, Dr. H. H. Hu.

METASEQUOIA, THE WORLD'S NEWEST "LIVING FOSSIL", IN ITS NATIVE HABITAT

(*For explanation, see the opposite page*)

Mr. Hwa has journeyed extensively in Szechuan and Hupeh to search for all the trees of *Metasequoia* growing in these regions. *Metasequoia* was first discovered at Mou-tao-chi of Wan Hsien in Szechuan province. There are found three trees, the largest of which is 33 meters in height and 3.3 meters in diameter at the swelling buttress and 2 meters in diameter at breast height; the other two are small trees. These are all the *Metasequoia* trees found within the boundary of Szechuan province. In Chien-nan county of Lichuan Hsien of Hupeh province Mr. Hwa discovered another tree measuring 30 meters in height, 1 meter in diameter at breast height; another in Wang-cha-ying measuring 35 meters in height and 2.1 meters in diameter breast high. From Ta-pan-ying through Shui-sa-pa to Shio-ho, along valleys about 40 LI long, there are large and small trees, altogether about 1,000 individuals, among which the large ones there number about 100, the tallest measuring 30 meters in height. The natives frequently dig the wild young trees or make cuttings and plant them along the rice fields or streams or before their doors. North from Wan Hsien and south down to Shui-sa-pa, the *Metasequoia* region extends to an area about 800 square kilometers, with Shui-sa-pa as the distribution center. Altitudinally *Metasequoia* is distributed from 800 to 1,350 meters. Within this region there is plenty of rainfall and a large amount of humidity, cool in summer and with heavy snow in winter. Its ideal site for propagation is the highlands in central and eastern and southwestern China at an altitude of about 1,000 meters.

As Professor Chaney returned to Nanking, Mr. Hwa was left behind to make further exploration. He traveled extensively in western Hupeh. Though no further discovery of *Metasequoia* trees has been made, he discovered several large tracts of forests which have not been discovered before. He made extensive collections of herbarium specimens. Surely there will be new species of plants discovered. Latest interesting news from him is that at the border region between Lichuan and Enshi Hsiens he discovered about a dozen large trees of *Taiwania,* all about 40 meters high, a genus of coniferous trees consisting of two species, one discovered in Formosa, and the other in western Yunnan and Upper Burma. This one found in western Hupeh may present a new species or may be either of the two existing species, or may be an intermediate form which will unite these two into one species.

The discovery of a *Taiwania* in western Hupeh is interesting enough, as it represents an endemic genus of conifer in China which is at the same time the tallest and longest living conifer tree in China. *Metasequoia* is no more than 35 meters in height and about 600 years or a little more in age, while *Taiwania* attains a height of 60 meters. Mr. C. W. Wang of the Fan Memorial Institute of Biology has felled a large tree found beside the upper Salween in western Yunnan, and found it to be 1,700 years old. As *Metasequoia* has been now widely introduced in America and

Europe, this new *Taiwania* should be introduced also, as it will thrive in the same territory as the *Metasequoia,* and is an almost as interesting but more majestic and more beautiful tree. Its discovery and the discovery of *Metasequoia* prove that there are still botanical treasures to be found in China, even in quite extensively covered regions such as western Hupeh, an area long explored by Professor Augustine Henry, and Wan Hsien, a region repeatedly traversed by Dr. E. H. Wilson and many other European and American botanists.

Since Chinese botanists have taken active part in the botanical exploration and systematic studies of Chinese flora, numerous new discoveries have been made, such as the genera *Pseudotaxus, Nothotsuga, Smithiodendron, Sinojackia, Rehderodendron, Huodendron,* and *Zenia,* all interesting trees, both botanically and horticulturally. Crowning all is the *Metasequoia,* the probable ancestor of the American redwood and the big tree, the "living fossil" discovered in Central China, the most remarkable botanical discovery in the century.

Choosing and Growing Herbaceous Peonies

By Harriette Rice Halloway

TO head the procession of peony beauty, four marshals should be chosen —if area permits. In chronological appearance they are *Paeonia tenuifolia,* distinctive because of the thread-like divisions of its leaves and its deep crimson, almost purple flowers which appear very early; hybrids of the yellow-flowered *P. Wittmanniana; P suffruticosa (Moutan),* or its hybrids, usually called the tree peony, because it is the only fully shrubby species in the genus; and *P. lutea,* another yellow-flowered species, and its hybrids, which are slightly shrubby in habit. Hard after comes the mass of *P. albiflora*—our best known herbaceous peony.

The first recommendation in choosing herbaceous peonies—or any group of plants—is to select what one *likes,* remembering at the same time to treat them always according to their *needs.* The second is to keep in mind the special use to which they are destined—landscape or cutting. When choosing for landscape it pays to make every effort to see the plant in bloom; for use as a cut-flower, a good exhibition of labeled specimens is, of course, sufficient.

It is important to know whether a variety is free blooming, with strong stems, with fragrance, as many are, and certainly without disagreeable odor. It is equally important to buy stock that is true to name, strong, healthy.

The Author Gives Credit

MISS HALLOWAY, from whose address on Members' Day at the Garden last June, the accompanying article is taken, acknowledges great debt to Mrs. Edward Harding—personally and to her books on peonies—for inspiration and advice. Her practical experience with peonies has been derived from long-continued study and work in her own garden and through designing and directing the care of the peony planting in Cedar Brook Park, Plainfield, New Jersey. This collection, which was begun in 1939, contains 85 varieties of peonies. With other outstanding park collections (of irises, daffodils and dogwoods) which Miss Halloway has planned and supervised in her home town, the peony collection is listed in Donald Wyman's "The Arboretums and Botanical Gardens of North America." Cedar Brook Park is one of the units in the system of the Union County Park Commission, a body recognized as a conspicuously broad-minded and progressive organization. "Though I am serving only as an amateur gardener," Miss Halloway says, "they give me a free hand and every co-operation, from the head down through all the departments, including the laborers." The beauty of this peony garden gives evidence of the success of this co-operative program.

It is always better to buy one first-class variety than, even at the same expense, two or three second-class varieties.

A list of types, according to the form of the flower, shows a wide range of choice: single, Japanese, anemone, semi-double, crown, bomb, semi-rose, and rose. Illustrations and descriptions of these types are on pages 75-77 of Mrs. Edward Harding's "The Book of the Peony." Both of her books on this subject* are as stimulating and valuable today as they were thirty years ago.

In the successful growing of peonies one of the less frequently realized factors is PATIENCE! Even under the best conditions these plants develop rather slowly.

Wise choice of location is important. Low, wet areas are fatal. A spot too close to a building means insufficient circulation of air; one too near trees and large shrubs means not only drip from above but root interference below. Herbaceous peonies need a great deal of sun and circulation of air, not only on the tops of the plants but on the soil under and around them. Background at a little distance improves the picture without harming the plants. Some should be put in the vegetable garden for cutting.

Fundamental is proper preparation of the soil—of which the most suitable is clay-loam. For plants which are to stand for some years, deep digging—not less than two and a half feet—is essential as a reservoir to hold food and water. Peonies are gross feeders, therefore well-rotted

*The second is "Peonies in the Little Garden," edited by Mrs. Francis King and published in 1923. "The Book of the Peony" appeared in 1917 under the J. P. Lippincott imprint. Neither, unfortunately, is available today except in libraries.

manure may be mixed with the soil at the bottom of the trench, although it should not be allowed to touch the roots. Bonemeal is adequate for the upper layers, provided they are of good garden loam. To allow for settling, this work should be done at least two weeks before planting—better sooner.

Plants can be set from mid-September through October—the earlier the better. They should be placed with the *eye* perfectly upright, two inches or a bit more underground. The directions taken by the fleshy roots are a secondary matter, but of course they must have plenty of room. Newly set roots should be mulched the first winter, to prevent heaving. The mulch must be removed in the spring and thereafter none be used. Peonies are better after freezing.

When replanting peonies the procedure is the same as for setting out new plants. There are, however, two additional factors to remember. The first is *never to put a peony where one has been without first removing all the soil*—widely and deeply. It can be carted to some other location and fresh soil brought in. Newly set peonies will not bloom in their own old soil—even when following a different variety. The other essential factor is to *divide the plants being removed* if they have stood for more than two or three years in one location; otherwise the blooms from them (if any) will be small and poor.

Herbaceous peonies require little care. After the second year, in the spring they should be fertilized with a mixture of bonemeal, wood ashes, and fine humus. Cultivation should be shallow. In a dry season there should be some watering. Except in the single varieties, if large flowers are desired all side buds should be pinched out when very small—leaving only the terminal. As soon as the petals fall the flower stalks should be cut off part way down. The lower sections, with several leaves attached, are needed to help strengthen the plants. In the autumn the plants should be fertilized again—this time bonemeal and wood ashes. When browned by frost all foliage stalks should be cut to the ground and *burned*.

Spring, summer, autumn—whenever there is a stalk dry or wilted it should be cut way down and burned. This precaution plus sunlight and good circulation of air will keep the plants healthy. Lacking this health, they may be attacked by a few disease germs. The wisest action then, if you have no reference literature at hand,** is immediate inquiry at the nearest experiment station or botanical garden.

Lack of bloom may sometimes be caused by great age or an unusually late frost. More often, however, it is the result of divisions developing slowly from weak or aged plants, exhausted or infected soil, too much shade, or neglect of the two operations required when replanting—dividing the plants and replacing the old soil.

From good varieties, healthy stock, properly planted, easily cultivated, patiently awaited, peonies give rich reward.

**This article will be followed in the spring with directions for the control of peony pests and diseases, to be prepared by Dr. P. P. Pirone.

The Immortal Botanist

The Strange and Stirring Story of José Celestino Mutis and the Eighteenth Century Botanical Expedition to Colombia in the Time of the Kingdom of New Granada

By Victor Wolfgang von Hagen

(*Continued from the August issue*)

IN 1791, three years after the death of that promoter of the new "enlightenment," Carlos III of Spain, the botanical expedition of New Granada (Colombia) headed by José Celestino Mutis, was ordered to move its headquarters to Bogotá. In full consciousness of its importance, the crown granted the expedition an entire block of land, not far from the viceregal palace, and funds for a building on Calle del Chocho to house its members as well as its library and herbarium. In that year Mutis had finished the writing of his "Flora de Bogotá," and concluded the work on the illustrations, the same illustrations which a few years before had so enthralled His Catholic Majesty.

But after Carlos III's imperious "Let it be published," the treasury, with the assistance of the royal printers, took over and tried to reduce the King's commands to precise figures. The cost, it was soon determined, would be ruinous. In a circular letter addressed to all the officials of Spanish America, the Marques de Bajamar, under whose jurisdiction the matter rested, admitted that the "Flora de Bogotá" was so vast, the project to publish the illustrations so great, that Spain at that precise moment (under huge expenses of war) was unable to publish it, *unless* individuals in the colonies helped to finance it. There being little response, the project was dropped.

If Mutis felt disappointment, he did not exhibit it. He had been requested to return to Spain to see the work through the press, but he had declined, saying he would rather remain in America until the 6,000 illustrations were finally done; but privately Mutis admitted that he was now so attached to New Granada that he did not wish to quit it. And then too the weight of his years was upon him and the desire for travel had gone out of his bones. More and more he was relinquishing the administration of the expedition to his nephew Sinforoso Mutis and to the young, dark-eyed Francisco José de Caldas, expert in astronomy and geography. Mutis kept closer to his writing desk, and out of his herbarium came hundreds of botanical studies.*

By this time the Expedición Botánica was, in point of fact, a scientific corporation, with eleven artists, its geographers, zoologists, botanists working in the field and possessed of a library—one of the finest botanical

** The Cultivation of Mangrove: On the Balsams of Peru; On the Methods of Making Rum from Sugar Cane; On the Sleep and Vigilance of Plants; On the Palms of New Granada,* and so on into botanical infinity, all of which, to the disgrace of Spanish science, were never published.

SITE OF THE HEADQUARTERS OF THE EXPEDICION BOTANICA

The ancient plaza of Sante Fé de Bogotá, now Bogotá, capital of the Republic of Colombia. Parts of this plaza—now the Plaza de Bolívar—still stand as in the time of the Spanish Viceroys. The buildings of the Expedición Botánica are located behind the Capitol, which is at the extreme right of the picture.

libraries in the New World and equal to any in Europe. It had a vast herbarium of upwards of twenty-four thousand collected plants, thousands of drawings, a collection of bird and animal skins, and instruments, precision instruments, which Mutis hoped to install in an observatory which he had already petitioned his King to build for him. More than a mere expedition, it was a renaissance, for Mutis had taken many young Americans out of the calm satisfaction of their instincts and had given them intellectual passion. There was young Matis, Francisco Javier Matis of the village of Guaduas, who became so adept at botanical drawing that he eclipsed the master Salvador Rizo himself; and most surprising, the aristocratic Jorge Tadeo Lozano, scion of the house of the Marquis de San Jorge who turned out to be an exacting zoologist, then putting the finishing touches to his manuscript, "The Fauna of Cundinamarca." And Caldas, of the melancholy eyes, then off in the jungles gathering plants, and Zea, Francisco Antonio Zea, who already showed himself an excellent systematist, but who in addition was an incipient revolutionist, one who kept trysts with the harridan of politics more often than he did with the muse of botany. More than serving as a mere scientific institution, the expedition was preparing the minds of a whole generation of young men, for not only would they lay down the basis of modern science in the Andes, but they would be the precursors of revolt. Already on the waves of revolution lapping over from the continent, the men of the expedition were frequenting TERTULIAS—literary sessions—within the house of Antonio Nariño. For in one of the shipments of books to the expedition had come—one knew not how—a copy of "Les droits de l'homme," and this, perhaps through the hands of Zea, found its way into the hands of Nariño, who translated and surreptitiously printed the first Spanish edition of Thomas Paine's revolutionary "Rights of Man." One bright morning in 1794, the viceroy found himself reading a mint copy of the book which was already convulsing the city. Out went the guard—into prison went Antonio Nariño, exporter of quinine, cacao and hides, and treasurer of tithes for New Granada, sentenced to ten years in a stinking, disease-infested dungeon. The Expedición Botánica was deeply involved. Some of its members took off quickly on expeditions to the jungles, but Zea was caught up, sentenced to prison in Cádiz.*

To the credit of the Viceroy he did no more than to give stern warning to Mutis and his young intellectuals: "Let them," he said in substance, "keep to their flowers, their pistils and calyxes, and leave the strumpet of politics alone—or else." And true to his word the King sent the money for the promised observatory. He had his ambassador in London secure a copy of the plans of the Greenwich Observatory designed by Wren and built in 1675, and this served as the model for the first observatory in the Americas. The foundation of the observatory was already laid when, on September 21, 1801, the famous explorer, Baron Alexander von Humboldt, arrived in Bogotá.

Humboldt, who had already traveled up and down the Orinoco,** with his companion, Aimé Bonpland, making scientific history, was well prepared to gauge the import of Mutis' work. In fact, the name of Mutis had long been known all over Europe. "I ardently desire to see the celebrated Mutis," Humboldt wrote to his brother, "the friend of Linnaeus who lives in Santa Fé de Bogotá, and to compare our herbarium with his." Humboldt was

* But upon his arrival in Spain Zea's facile tongue got him out of this predicament for, instead of being made the King's prisoner, he became the King's botanist and was put in charge of the Jardín Botánico. There he remained until revolution swept his native land and he slipped back to New Granada to become one of the key figures in the fight for independence.

** See "South America Called Them" by Victor Wolfgang von Hagen, published by Alfred Knopf, New York, 1945.

THE ASTRONOMICAL OBSERVATORY AND ITS FOUNDER

(On the opposite page)

Two views of the first observatory built in the New World, erected for Mutis with funds provided by the King of Spain and designed after Christopher Wren's plans for the Greenwich Observatory. Built in 1803, it was used not only by Mutis himself but by Humboldt, Bonpland, Codazzi and Boussingault, among other early scientists in South America, and it is still in use today.

Above at the right, a portrait of José Celestino Mutis by an unknown artist, now hanging in the Museo Nacional, Bogotá. It shows the famed botanist in his priestly robes. A plant of the genus *Mutisia* which Linnaeus named, entwines the bust, while another Linnaean plant, *Rizoa,* named for Salvador Rizo, artist of Mutis' expedition, lies at the base.

This article on José Celestino Mutis is part of a forthcoming book by Dr. von Hagen to deal with the great South American explorers and to be entitled "A Place to Stand."

THE ASTRONOMICAL OBSERVATORY AND ITS FOUNDER met in state and installed next to Mutis in his official house on Calle del Chocho. Humboldt drew on his most picturesque speech to describe the magnificent drawings that illustrated the "Flora de Bogotá": ". . . for fifteen years there had been thirty painters working with Mutis and he now has three thousand drawings in color—colors unknown to European colorists . . . *très magnifiques!*" And what amazed him more was the library: "With the exception of Sir John Banckes' library in London, I have never seen a larger one than that of Mutis." When Humboldt left, Mutis pressed upon him a copy of his portrait and one hundred of his finest drawings from the "Flora de Bogotá." Later, when Humboldt published his epoch-making "Plantas Equinocciales" an engraving of Mutis was its frontspiece with the inscription:

> "To Don José Celestino Mutis, Principal Director of the Royal Botanical Expedition of the Kingdom of New Granada, Astronomer in Santa Fé de Bogotá. As a small token of our admiration and acknowledgment.
> A. Humboldt Aimé Bonpland."

This was the highlight of Mutis' life. Although he continued to carry on, after Humboldt's departure his great frame could no longer carry the weight of his years nor the accumulated effects of life in the tropics. On September 2, 1808, the creator of the renaissance of New Granada died in his adopted land; his final request was that his "Flora de Bogotá" be printed with all its illustrations so that his forty-seven years of toil would not have been in vain.

Poor Mutis! Who could have foreseen the vicissitudes through which his work would pass before it was printed? Seized by Spain in 1816, after the revolution it would be taken to Spain to prepare it for publication. Then again revolution and "Mutis" would be back in the mothballs. In 1881, again aroused by its past glories, the Spanish government would employ the Colombian botanist José Triana to begin the classification of Mutis' plants with the idea of publication. Again, difficulties, and the work forestalled. In 1935 after years of preliminary study of Mutis, Dr. José Cuatrecasas would begin to put the work in order for publication and again the apocalypse of revolution and the work in its entirety would be carried away, this time to France for safekeeping. And so now after one hundred and sixty years let us hope that there will be no other contretemps . . .

Yet the Expedición Botánica did not expire with the death of Mutis.

Francisco José de Caldas, who had been born in Popayán in 1771, took over its directorship. Precocious and introverted, Caldas was the explorer of the group and before he had reached twenty he had gone wandering up and down the Andes, using precision instruments which he had cast with his own hands. Yet despite his wandering he found time to marry and to sire three children and to write many a scientific paper (most of which remained unpublished in the Spanish manner) before he settled down in Bogotá. But Caldas was living in a revolution and by July 20, 1810, the New Granadans had proclaimed their independence, jailed their ex-Viceroy, opened business as a Republic. There was hardly a member of

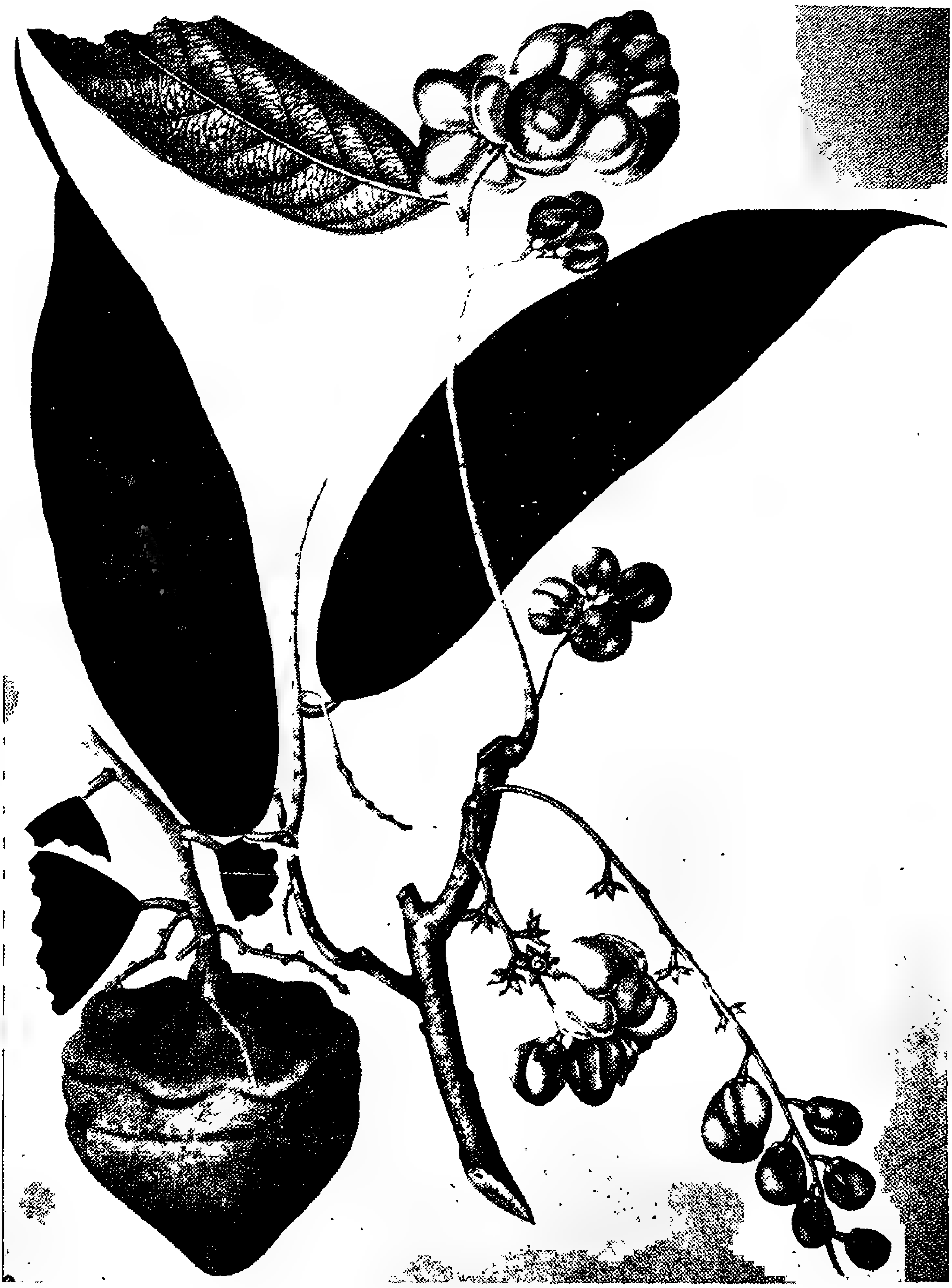
TWO OF MUTIS' MOST DEPENDABLE COLLEAGUES

Left, **Eloy Valenzuela, one of the original staff of the Expedición Botánica formed in Bogotá in 1783. A priest and a scholar, Valenzuela outlived most of the members of the expedition. He is shown examining an illustration of the plant *Rizoa,* named after Salvador Rizo, the first artist of the expedition. Painted by Salvador Rizo and located in the Museo Nacional, Bogotá.**

Right, **Francisco José de Caldas (1771-1816), who took over the direction of the Expedición Botánica on Mutis' death. He was one of the original geniuses of South America, a naturalist and physicist. One of Colombia's patriots, he was executed by General Morillo on October 29, 1816.**

the expedition who did not have a hand in it, none who did not hold office at one time or the other, in the short-lived republic. As New Granada was surrounded to the south and the east by royalists, the young republic had to fight for its life, so Caldas and the expeditionists reluctantly gave up science and entered the confusion that was the army. There never was any peace between the years 1810 and 1816, for although Spain was tied down on the continent with the Napoleonic wars, she managed to keep up pressure on the flanks of New Granada. Then came the presage of disaster; in swift succession came the French attack on Russia, the retreat, Napoleon's abdication, Elba, Waterloo, and then the Treaty of Vienna.

With the final defeat of Bonaparte, Spain was now free to act. The crown hastily assembled an armada, made up mostly of veterans from the European wars, General Pablo Morillo as its leader; his instructions:



BRANCH OF A MONKEYPOT TREE, DRAWN BY FRANCISCO JAVIER MATIZ

This "olla de mono" is one of the 2,800 illustrations selected for the "Iconographia de la Expedición Botánica de Mutis" now in preparation for publication in Spain. The colored plate of this species of *Lecythis* will measure 12 x 18 inches when it is reproduced. (Courtesy of the Astronomical Observatory, Bogotá.)

"Pacify New Granada." He quickly laid siege to Cartagena, and after its conquest one city after another fell before his veterans; on May 6, 1816, he entered Bogotá.

"Pacification" was simple and expedient: names, (supplied by royalists within the city) were called out, and they were quickly adjudged by a drumhead court of which Morillo was the first and last appeal . . . and the condemned were liquidated. It took this fierce general but a moment to determine that the Expedición Botánica, with the regiment of intellectuals it had spawned, was an infection spot of revolution. He sent over a squad of soldiers, rounded up every one of them that had not fled, and seized their papers. In the King's name Colonel Antonio van Halen took over all the manuscripts of Mutis and seized the herbarium with its six thousand illustrations that had once brought tears to Carlos III and sent Humboldt into rhapsody. Into Morillo's hands, and thence to Spain for safekeeping and mummification went forty-three boxes of Mutis' manuscripts, the cornerstone of the intellectual life of New Granada.

The executions went on with monotonous regularity, a roll of muffled drums, the sentence, command, a wall of fire . . . and the streets of Bogotá gagged on viscous blood. One by one the members of the Expedición Botánica were captured and placed against the wall. To his death in a festive mood went Salvador Rizo, chief artist of the expedition, one of the most accomplished botanical painters of his time; next the aristocratic Jorge Tadeo Lozano, a naturalist without apotheosis since his work on the fauna of Colombia was completely destroyed in the holocaust. Those that were not shot were imprisoned in slow death in the dungeons of Cartagena.

By the time they caught Caldas in the south of Colombia at the village of Cuchilla del Tambo, just when he was about to escape, the destruction was all but complete. Caldas wept openly when he heard of the destruction of the expedition, its work lost, or scattered, its members dead, the work of a half century made useless. In a letter famous for its stoicism Caldas begged Morillo† for a reprieve so that he might finish the work of the Expedición of which he alone now possessed the key. He begged not so much for his life, but for an extension of that life in order to complete the work of the immortal Mutis.

Morillo was unmoved. The execution was ordered to take place on schedule. As Caldas, arms pinioned to his back, was marched out to the square in front of San Francisco, more than mere man was dying, a whole segment of intelligence, of culture, was being uprooted. Obliterated. Even as Caldas dropped, perforated by a dozen bullets, General Pablo Morillo could be heard, declaiming in a rasping voice, above the rattle of musketry:

"Spain has no need of savants."

---

† This letter was addressed not to Morillo himself but to one of his lieutenants, Pascal Enrile.

A list of references will be found on the following page.

LIST OF REFERENCES

The following books, articles, and manuscripts were consulted by the author for the writing of the accompanying article on José Celestino Mutis, "The Immortal Botanist." In addition, various notes and manuscripts in the Archivo Nacional, Bogotá, were made available to him.

Anonymous. An Eighteenth Century Scientist in Colombia: José Celestino Mutis (Bulletin of the Pan American Union, Washington, June 1932).

Colmeiro, Miguel. La Botánica y los Botánicos de la Península Hispano-Lusitana (Madrid, 1858).

Dugand, Armando. Memorandum on the Mutis Herbarium and paintings at Madrid (letter to the author).

González Suárez, Federico. Memoria Histórica sobre Mutis y la Expedición Botánica de Bogotá (Quito, 1905).

Gredilla, Federico. Biografía de José Celestino Mutis (Madrid, 1911).

Hernández de Alba, Guillermo. Archivo Epistolar del sabio naturalista José Celestino Mutis (projected three volumes). Vol. I published August 1947 (Bogotá).

Killip, Ellsworth P. A scientific resurrection of the Mutis Herbarium at Madrid (Bulletin of the Pan American Union, Washington, March 1933).

Mendoza, Diego. Expedición Botánica de José Celestino Mutis al Nuevo Reino de Granada y Memorias Inéditas de Francisco José de Caldas (Madrid, 1909).

Revista de la Academia Colombiana. Vol. II, Jan.-Feb.-March 1938, No. 5—Articles on Humboldt, Mutis, Caldas.

Schumacher, Hermann. Sudamerikanishe Studien (Berlin, 1884).

Smith, Sir James E. A selection of the correspondence of Linnaeus and other naturalists (London, 1821).

Trías, Ramón. La Expedición Botánica al Nuevo Reino de Granada (Bogotá, 1947).

NOTICES AND REVIEWS OF RECENT BOOKS

Belated Diary

A SCIENTIST WITH PERRY IN JAPAN. The Journal of Dr. James Morrow. Edited by Allan B. Cole. 307 pages. Chapel Hill, University of North Carolina Press, 1947. $4.

When Commodore M. C. Perry, U.S.N., in charge of the expedition of an American squadron to the China Seas and Japan, requested rigid adherence to the order that all notes and drawings made by persons on the expedition be transmitted to the commander-in-chief, he was disregarded by the agriculturist of the expedition, Dr. James Morrow of Willington, South Carolina. Dr. Morrow returned from Hongkong on the storeship *Lexington* and reached the Brooklyn Navy Yard on the 16th of February, 1855, after an absence of practically two years, including 18 weeks around Honshu and Hokkaido, the two larger islands of Japan. He finally got his diary and notes to Commodore Perry on April 22, 1857, but it was then too late to incorporate them in the monumental report of the expedition, as the Commodore admitted somewhat regretfully in a letter to the Secretary of State.

Through the efforts of Allan B. Cole, this diary is brought to light in print, and its story will prove of great interest to many people intrigued with the transfer of plants and information about them from one part of the world to another in the days when a few hours did not suffice to transport a voyager or a cargo to the antipodes.

Dr. Morrow's entries are full of interesting and perceptive description about the friendliness of the people, their customs, agriculture, and the plants observed in cultivation and growing wild. The notes relate the discharge of his official duties in the expedition—taking charge of seeds, plants, and agricultural machinery to be given to the Japanese people through their military governor, the Tokugawa shogun. In addition, Dr. Morrow purchased grains and seeds to be sent to the Department of Agriculture and certain agencies, and the plant specimens he collected in China, Okinawa, the Liuchius, and Japan proper totaled between 1,500 and 2,000, of which between 300 and 400 were living plants. Among the plant specimens, sent to Dr. Asa Gray at Harvard and other specialists for determination and description, were 41 new species and one new genus, including the bush honeysuckle which remains to this day one of the most attractive hardy shrubs for our landscape plantings, *Lonicera Morrowii,* and a decorative hardy sedge, *Carex Morrowii.* The means Dr. Morrow used to obtain some specimens at Shimoda, with both parties concerned willing to disregard official regulations governing the sale of articles, would seem to be the first record of a type of transaction that has been found convenient in these same islands within recent years.

It is indeed commendable that Dr. Cole's efforts have raised these records out of their long obscurity in the government archives, and we are fortunate to have them available in such a sympathetically and expertly documented fashion.

B. C. Blackburn,
Gladstone, N. J.

History and Culture of Dahlias

DAHLIAS, WHAT IS KNOWN ABOUT THEM. Morgan T. Riley. 201 pages, illustrated, indexed. Orange Judd Publishing Co., New York, 1947. $2.50.

A number of books on dahlias have been published in the last decade, but such is the demand that all are out of print, including the last previous one, "The Dahlia" by J. Louis Roberts, and Mr. Riley has informed us that the first printing of his book is already nearly exhausted and a new edition is contemplated.

Mr. Riley's volume is a collection of cultural data gleaned from many growers, at least some of whom, including the reviewer, were never informed that they would be quoted and mentioned.

The book begins with a "history of the dahlia in pictures." The second chapter compares and contrasts the cultural practices of three successful exhibitors over many years in the New York show of the American Dahlia Society. But the technique and practices of the three do not coincide and it is perhaps asking too much of a beginner in exhibiting to follow any or a combination of their ideas. Advanced growers could get more out of them.

Other chapters include culture, cloth house and shading, keeping dahlias, the last 24 hours (before exhibiting), the trial grounds, digging and storing, and other subjects. The book covers a lot of ground, but often the terms used are not defined. Had the author had more actual experience himself in growing dahlias the overworked editorial "we" would more often have been "they."

Cultural directions are given with some repetition and with considerable variation in the practices of the people quoted. The author has depended on hearsay and statistics to a point where the practical side of green thumb experience is lost.

Certainly the book, in spite of these shortcomings, proves one thing. The growing of dahlias for exhibition is far fror being an exact science, but interest is intense and increasing. Dahlia growers, particularly advanced amateurs, can pick up some valuable suggestions from the experienced growers who are quoted.

LYNN B. DUDLEY,
Eastern Judge, Flower Grower's National Dahlia Honor Roll

Down-to-earth Background For Farmer and Farm Student

PRACTICAL FIELD CROP PRODUCTION FOR THE NORTHEAST. Gilbert H. Ahlgren and others. 437 pages, index, illustrations, charts and tables, suggested bibliography, glossary of terms used, student activities and projects. Rutgers University Press, New Brunswick, N. J. 1947. $4.

Practical Field Crop Production for the Northeast by Dr. Ahlgren and his associates at Rutgers University is one of the few books that deals directly with northeastern agriculture and particularly with crop production of the northeastern portion of the United States.

As pointed out in the foreword of this text, the Northeast, though highly industrialized, nevertheless ranks high as an agricultural area, particularly for the production of food crops for which the industrial population is an ever-increasing market.

The text includes excellent diagrams illustrating characteristic growth of certain crop plants and of diseases and insects affecting them. Many photographs portray modern methods of production. Charts and tables serve to emphasize various factors of economic importance.

Some consideration is given to soil improvement and conservation measures. Small grain production is treated briefly with emphasis on seed improvement.

A large proportion of the text deals with the production of hay, making of silage, and the improvement, management and maintenance of pastures, all of which are important in the agricultural program of the Northeast.

The essential facts regarding the production of potatoes, beans and tobacco are discussed in four brief chapters. There is also a discussion of the identification, economic importance and control of the common farm weeds. A few paragraphs relate to the chemical control of weeds and suggest the possibilities of the newest herbicide 2,4-D.

The glossary and tables of recommendation in the appendix are valuable supplements to the text.

There has been a real need for such a book. This text will, however, serve best those who have some knowledge of the growth of crop plants and of farm operations in general, but who seek practical down-to-earth suggestions, with the detailed mass of supporting data reduced to a minimum. High school students of vocational agriculture, and students in agricultural institutes and colleges of agriculture in the northeastern states should find much real value in its pages.

The book should also serve as a source of much up-to-date information of value to the practical and progressive northeastern farmer.

L. M. STEPHENS, *Head, and*
HOMER B. NEVILLE, *Instructor,*
Dept. of Crops & Farm Management,
Long Island Agricultural and
Technical Institute.

Nature Crafts and Knowledge —Three New Books

PLANTS. Herbert S. Zim. 398 pages, illustrated, indexed. Harcourt, Brace & Co., New York, 1947. $3.50.

Beginning with a general overview of the world of plants, Dr. Zim follows with a clear picture of those two major problems, classification and identification. For those amateurs who have a general knowledge of plants and the urge to be more scientific, yet are too lazy to master Gray or a standard text in botany, these are excellent chapters.

How to form a collection of plants, preserve them, mount them, and label them are explained and a number of hobbies such as edible plants, leaf prints, a study of woods, how to form seed collections, the microscopic study of pollen and plant cells and even the building of a terrarium, are suggested for the collector. The reader who lives in the city may find something he can follow as successfully as a country dweller.

There are additional chapters on plants of the past, domesticated plants, plant experiments, and plant locations worth visiting. Dr. Zim's survey of the world of plants has appeal both for the amateur and the professional student of plant life.

The book has excellent black and white drawings and each chapter has a splendid list of suggested books and readings.

NATURE QUESTS & QUIZZES. Raymond T. Fuller. 64 pages, John Day Co., New York, 1948. $1.50.

This is a book you will really want to own. It is different. It will give you quiet enjoyment for years and years.

It should prove a ready solace whenever your "nose is being kept to the grindstone." You must have a copy for your very own self and each of your cronies should have one so that you may gloat over your accomplishments together.

Warning! Read the preface and do exactly as it tells you!

THE BOOK OF NATURE HOBBIES. Ted Pettit. 280 pages, illustrated, Didier, New York, 1948. $3.50.

Many pamphlets and guides to nature hobbies have been published since Anna B. Comstock first published the "Handbook of Nature Study." The Audubon Society, The Boy Scouts of America, and Cornell University all from time to time issue a leaflet or booklet on some nature hobby. We now have in "The Book of Nature Hobbies" a useful compilation of many of these ideas plus many new ones.

If you want a book that the whole family can use, one which gives ideas in every field of nature: bird watching, growing plants, studying insects, catching fish, the study of mammals and the conservation of our wild life—then this is the book.

Each chapter has a list of projects that can be carried out and completed with a minimum of effort, yet each has an interest and a challenge that makes it worth while. There is a hobby for everyone.

The illustrations are lifelike, the drawings easy to follow. There is an excellent bibliography and guide to nature books.

WILLIAM O. ASTLE,
Flushing, N. Y.

Chapter in Agronomic History Gleaned Directly From The Men Responsible

THE HYBRID-CORN MAKERS. A. Richard Crabb. 331 pages, illustrated, indexed. Rutgers University Press, New Brunswick, N. J., 1947. $3.

The loose ends of the history and development of hybrid corn have been drawn together in this book. E. M. East, G. H. Shull, D. F. Jones, H. A. Wallace, Lester Pfister, and a host of others are properly credited with their part in making hybrid corn the success it is.

In contrast with most histories of agronomic progress, the author has obtained this material first-hand from the men, most of whom are still living, who played major roles in this unended drama. The various phases of development are so well fitted and blended together that the entire panorama stands out clearly in both time and space. Mr. Crabb's projection into the future of the principles learned during the rise of hybrid corn present a challenge to all breeders of plants and animals. The introduction by Dr. Hughes is a masterful presentation of the difficult subject, "What is hybrid corn?" and is in itself worth the price of the book.

Because of the forthright and interesting presentation of the facts gathered into this book, it should be read by everyone concerned with plants and agriculture.

JOHN C. ANDERSON,
Farm Crops Dept.,
Rutgers University.

With Roses Added

A GARDEN FOR YOU. Edited by Thomas C. O'Donnell. 200 pages, illustrated. McBride, New York, 1948. $5.50.

The title page doesn't say so, but this is a new edition of Mr. O'Donnell's folio-size book of 1946, which was reviewed in this Journal in July of that year. The whole book is done by offset, and the only change is the addition of a 40-page chapter on roses, which turns out to be an offset reprint of chapters 2 through 14 of C. F. Mappin's volume, "Bigger and Better Roses," published by McBride twelve years ago and reviewed in this Journal in December 1936. The eight original illustrations are all reproduced, with a dozen others, mostly of newer rose varieties, plus five practical photographs showing how to plant a rose.

CAROL H. WOODWARD.

Managing Small Woodlands

MANAGING SMALL WOODLANDS. A guide to good and profitable use of forest land. A Koroleff and J. A. Fitzwater. 72 pages, illustrated. American Forestry Association. 1947. $1.

This publication is crammed with valuable information and advice for the owner of woodlands in the agricultural regions of continental United States. It is essentially a boiled down survey of a college course in general forestry, including the subjects of thinning, cutting, logging and marketing, diseases, insects and fire, flood control and soil conservation. The relation of forests to wildlife is omitted. The book's solid factual information is creditably expressed in simple fluent English, and made even more attractive by the excellent, instructive, often humorous illustrations of R. Kulbach. The authors do well in generalizing for forest conditions throughout the 48 states, directing the reader to a list of references at the end for specific local information, and directing him to a list of state foresters and agencies for local recommendations and advice. This bulletin will succeed in giving the woodland owner an intelligent understanding of the life of the forest and of its profitable management, leading not only to his own financial advantage, but to the preservation and conservation of one of our nation's resources.

New Course Offered In Landscape Design

A new course comprising two terms of study in the designing of the home grounds will commence at the New York Botanical Garden Thursday afternoon October 7. The instructor will be Alice L. Dustan, who until October 1 is Garden Editor of *House Beautiful* magazine. Miss Dustan has previously been on the gardening staff of *House and Garden* magazine and the New York *Times*. She has studied botany, horticulture, and landscape design at the New Jersey College for Women, Ambler School of Horticulture, Columbia University, and Cornell University, where she received a Master of Science degree.

Miss Dustan's course is planned for the home owner who wishes to make his own design and do his own planting. Each term will consist of five 2-hour lectures, on successive Thursday afternoons, starting at 3 p.m. The first term will provide instruction on how to measure one's property and start a practical planting plan, with consideration of driveways, walks, walls or fences, and service areas for the household and garden, including compost pile and coldframes. This will be followed by a study of suitable trees for shade and ornament and shrubs for flowering and foliage effects.

Studies in the second term, which will begin Nov. 11, will include construction materials for garden appurtenances, vines and ground covers, herbaceous plants, and the finishing touches for a garden plan, such as succession of bloom, contrasts in foliage, attractive combinations of flowers, and garden accessories, with a concluding lesson on practical methods of procedure for the planning and eventual planting of garden grounds.

Miss Dustan will offer constructive criticism of the design presented by each student in the class. The fee for the course will be $7.50 for each term.

Miss Dustan will also open the autumn series of Saturday afternoon programs with a lecture entitled "A Gardener's Tour of the U.S.A.," illustrated with her own kodachromes.

For a list of other courses and lectures being offered this fall at the New York Botanical Garden, see the inside of the front cover.

Notes, News, and Comment

This Month's Cover. The Manhattan rooftop garden in the East Fifties shown on the cover this month represents one of a collection of photographs of New York City gardens made by Frederick W. Raetz of New York, and exhibited on the mezzanine of the Museum Building during the latter half of the summer.

Visitors. Among the botanists and horticulturists who spent a day or more at the Garden during July were A. C Jordahn of the Fairchild Tropical Garden; Dr. & Mrs. Philip A. Corliss of Somerton, Arizona; Jesus M. Idrolio of Bogotá, Colombia; Julian B. Acuña of the Agricultural Experiment Station in Cuba; Elizabeth McClintock of Los Angeles; Dr. & Mrs. Hiden T. Cox of Agnes Scott College, Decatur, Georgia; Dr. & Mrs. John R. Reeder of Yale University with Chio Shuh-yuen, a student there; Mrs. R. W. Nauss, just returned from Woods Hole, Mass.; Dr. F. R Fosberg, on his way back from international conferences in Utrecht and Paris and H. W. E. Croockewit of Amsterdam

South American Trip. Dr. H. N. Moldenke was scheduled to leave New York Aug. 29 for a three-month trip through South America, during which he will represent the New York Botanical Garden at the second South American Botanical Congress in Tucumán, Argentina Oct. 10-17. Accompanied by Mrs. Moldenke, he will visit 21 Latin American countries and 72 botanical institutions on his itinerary.

Medal. Lambertus C. Bobbink, who has long been closely associated with the New York Botanical Garden through his active interest, particularly in the Rose Garden, which is essentially his gift, was awarded the Charles H. Totty Memorial Medal on March 10, for his contribution to and achievements in horticulture Presentation was made by Helen Totty.

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue surface car to Bedford Park Boulevard

Membership in
THE NEW YORK BOTANICAL GARDEN
and what it means

TO THE INSTITUTION, membership means support of a program that reaches several hundreds of thousands of persons annually.

Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

TO THE INDIVIDUAL, membership means, beyond the personal gratification of aiding such a program, these privileges:

Free enrollment in courses up to the amount of the annual membership fee paid.

A subscription to the Journal, to "Through the Garden Gate" and to Addisonia.

Admission to Members' Day programs and use of the Members' Room also at other times.

A share of plants when made available for distribution. (These plants may include the Garden's new introductions into horticulture.)

Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

Business firms may become Industrial Members of the New York Botanical Garden. Information on the classes of Industrial Membership and the privileges of membership will be sent upon request.

* * * *

Classes of membership in the New York Botanical Garden in addition to Industrial Memberships are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
Sustaining Member	25	Fellow for Life	1,000
Garden Club Affiliation	25	Patron	5,000
Fellowship Member	100	Benefactor	25,000

Contributions to the Garden may be deducted from taxable incomes.

Contributions to the Garden are deductible in computing Federal and New York estate taxes.

A legally approved form of bequest is as follows:

I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of*____________________.

Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

Vol. 49 | OCTOBER | PAGES

No. 586 | 1 9 4 8 | 225 — 248

OCTOBER EVENTS AT THE GARDEN

Members' Day Program

3 p.m. in the Members' Room

Oct. 6 ***"Insurance" For Your Plants*** — *P. P. Pirone*, Plant Pathologist

Courses of Study

Two-Year Course in Practical Gardening

Cultivation of Trees & Shrubs — Sept. 30 - Dec. 16 — Six sessions, alternate Thursdays, 8 - 10 p.m. Instructor: *J. H. Beale* — $10

Designing the Home Grounds — Autumn term, Oct. 7 - Nov. 4 — Five sessions, Thursday afternoons, 3 - 5 p.m. Instructor: *Alice L. Dustan* — $7.50

Free Saturday Programs

Complete schedule mailed on request.

3 p.m. in the Lecture Hall

HARDY CHRYSANTHEMUM DISPLAY AND PROGRAM

In co-operation with the

NATIONAL CHRYSANTHEMUM SOCIETY

Friday, Saturday, Sunday . . . October 22, 23, 24, 1948

Opening Friday at 2 p.m. — Free to the Public

DAILY

Outdoor Display of Hardy Chrysanthemums — 10 a.m. to 6 p.m.

Competitive Exhibits — In the Museum Building, Friday 2 p.m. to 5 p.m. Saturday and Sunday 10 a.m. to 5 p.m.

Chrysanthemum Paintings in the Chinese Manner — By *Wang Chi-Yuan*
On the mezzanine, Museum Building
Professor Wang's exhibit will continue through November 14

FRIDAY PROGRAM

3 p.m. in the Lecture Hall

Chrysanthemums as I Grow Them — An informal talk by *Ernest L. Bertram*, President, National Chrysanthemum Society

Flower Arrangements With Chrysanthemums — A demonstration by *Mrs. Loren R. Dodson*

SATURDAY

Children's Competitive Chrysanthemum Exhibit — In the basement of the Museum Building, Noon to 5 p.m.

* * * * *

TABLE OF CONTENTS

OCTOBER 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription $1.50. Single copies 15 cents.

JOURNAL

of

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

OL. 49 OCTOBER 1948 No. 586

he Indigenous Food Plants f West African Peoples

By F. R. Irvine

I

HE origin of man's foods in any country is a fascinating study. In Africa, much can be learned from early explorers and from a study the present-day African's food plants and methods of agriculture. Today the foods most commonly in use are of American or Asiatic igin, such as cassava, groundnuts, plantains, coco-yams, and maize. it there was a time when these were not known, when the original inbitants had to depend on their own indigenous plants. Some of these ants are still used today, though generally not as staples, while some are ly used in times of scarcity.

ie Climate and its Effects

Over much of West Africa there is one long dry season, alternating th one rainy season during which planting is possible. In wetter coastal ain forest" regions two rainy seasons occur, one of "main rains" and e of "small rains." These climatic factors largely determine the hunting, hing, and planting habits of the people. The alternating periods of d shortage and abundance are partly counteracted by food storage. In ars of very low rainfall or plagues of locusts, famine such as is common primitive man elsewhere sometimes occurs even nowadays. At such es, emergency foods are gathered from the wild. These may be ots, such as wild yams and others, which sometimes require prolonged king, washing, and boiling to eliminate poisonous elements. Sometimes y consist of tiny seeds of wild grasses, some of which are parched in sun (1) * before being prepared for cooking. Wild fruits in their oper season (2) are generally eaten raw, but the many leaves which collected for food are cooked. Mushrooms (2) of various kinds and

igures in parentheses refer to the list of publications at the end of Part I.

IN THE NORTHERN PART OF THE GOLD COAST NEAR GAMBAGA

Typical savannah country is shown here as it appears early in the rainy season. Later, the grass will be much taller. Photograph by courtesy of G. S. Cansdale, Zoological Society of London.

even gums from acacia (3, 5) and other trees may be eaten. But such famine conditions are much less severe in modern Africa, as food can be brought much more quickly to famine areas. In earlier times, severe famines were more common, particularly during intertribal wars, aggravated as conditions often were by the slave trade.

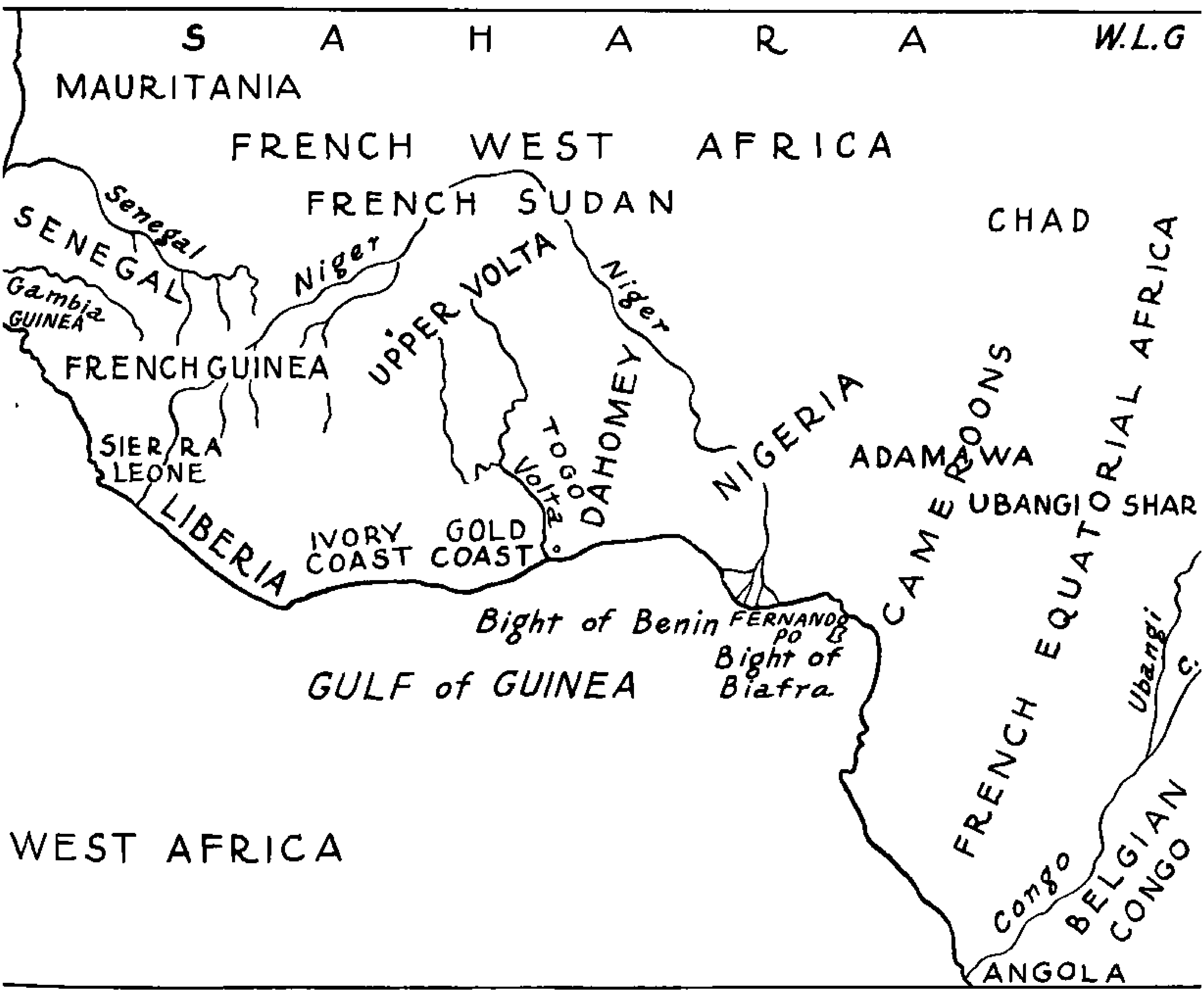
The Food of Primitive Africans

Kolben (1731) describes the way in which the indigenous inhabitants of South Africa followed the hedgehog and baboon to discover their sources of food, and refused to taste any kind of root or fruit which these animals did not eat (4). Schultze (1907) reports that the Namas of South Africa rob stores of grass seeds collected by black ants, grinding and roasting the flour they obtain thereby (5). Honey has always been widely used in Africa, where it is generally robbed from wild bees' nests. Primitive beehives are sometimes constructed, however, but the whole colony is destroyed when the honey is taken. The use of modern beehives is hardly known at present in West Africa. While in such countries as Senegal and Gambia it is the beeswax which is exploited, in many other areas honey is the product sought from the nests or hives. Though it is gathered principally for food, its use in making mead, an intoxicating drink, is also known.

The meat diet, being deficient in many districts, has sometimes been supplemented by animal proteins of insect origin, such as termites (white ants), locusts, and certain beetle larvae, while in Rhodesia, certain caterpillars are also eaten (2).

Prehistoric hunters in the largely uninhabited West African rain forests probably noted, as African hunters do today, which fruits were eaten by gorillas, chimpanzees, monkeys, elephants, antelopes, and other animals, and so learned to eat them too. In more open parts early man probably used his hands or some primitive tool, such as a digging stick, in digging up wild roots. It is certain that he discovered only by trial and error which plants could be eaten; some of his feeding experiments must have ended in illness, and even in death.

Just as in olden times the more agricultural of the American Indians did not subsist entirely on their crops, but also gathered certain plants from the wilds (6), so it was in West Africa (7). As primitive Africans took up a more settled form of life and became agriculturists, they brought numerous plants into cultivation near their homesteads. When clearing the bush for farms, they would sometimes carefully preserve those trees which bore edible fruits (8).



Agricultural Practices

It is known that the sparsely populated rain forest areas were formerly much more extensive. With the opening up of the country and the planting of perennial crops such as cocoa, from the Americas, immense areas of such forest have been cut down.

Swamps often made farming difficult, the huge buttressed trees, the rapid regrowth of woody plants, and the inadequate tools available, all made clearing arduous. Moreover, the labour in disposing of felled trees and shrubs is immense. Because of the deadly tsetse fly, which carries trypanosomiasis (sleeping sickness), game animals were scarce and draught animals could not be kept, so that ploughing was impracticable. The rain forest was probably used for hunting smaller game animals, edible snails and the like, which fed on fruits and other forest products. Later, man settled there, making small farms in the drier parts of the forest and practising shifting cultivation.

An understanding of shifting cultivation is fundamental to any student of West African agriculture. Areas of primary or secondary rain forest, or of other types of vegetation, are cleared and burnt over and crops are planted for a period, generally of two to three years. After this the farm is abandoned, as the soil has deteriorated, annual weeds have increased, and woody plants gradually crowd out the remaining crops. The vegetation which replaces them is of an inferior type to the original forest. It is known as "secondary forest" and consists of quick-growing and softer-wooded trees, as well as shrubs and climbers. Such areas of secondary forest may be cleared again later, perhaps on more than one occasion, to the detriment of the original rain forest species.

Sources of Staple Foods

There is little evidence that any of man's main staple foods occurred wild in these rain forest areas. The two most likely indigenous crops of such regions — some of the yams (*Dioscorea* species) and the oil palm (*Elaeis*) — are both inhabitants of previously cleared forest land. The yearly regrowth of yam stems and slow growth of oil palms prevented their survival in the rain forest. Certain *Cola* trees, however, really occurred there, but the main food crops of forest areas today — cassava, plantains and bananas, citrus fruits, pineapples, papaws (or papayas — *Carica Papaya*), coco-yams, sweet potatoes, and maize — were all introduced from elsewhere. In the drier grassy forest (savannah) regions, other food plants such as the locust-bean (*Parkia*), beniseed (*Sesamum*), the shea butter tree (*Butyrospermum*), yams (*Dioscorea*), Guinea corn (*Sorghum*), and bulrush millet (*Pennisetum*) occurred.

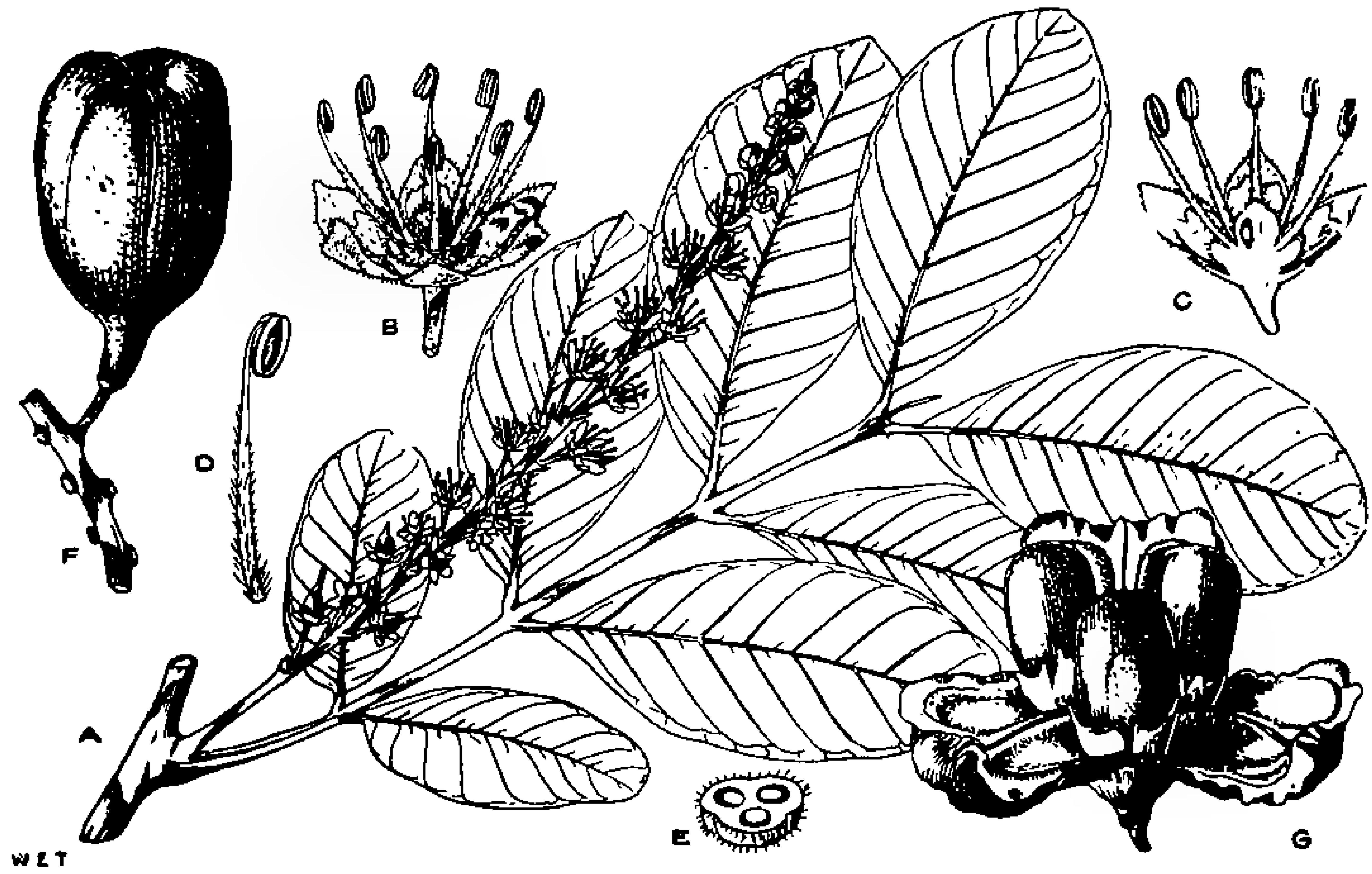
GUINEA GRAINS AND SESAME SEED — TWO OF WEST AFRICA'S EXPORTS

On the left, *Aframomum Melegueta* is the plant which gave the name to the Guinea "Grain Coast" of early days. Its spicy seeds, called "Guinea grains" or "grains of paradise," also "melegueta pepper," were exported to Europe as a flavoring and medicine.

An ancient plant from tropical Africa, sesame, called "beniseed" in the west, is now widely grown in many parts of the continent. Oil is pressed from the seeds and the residue is used as cattle cake. The leaves, also the seeds, which are first ground and roasted, are put in soups.

Exportable Products

Very few indigenous West African plants, so far, have attracted sufficient attention outside West Africa to result in their exportation. The two principal ones are the KOLA tree (*Cola*), whose fruits provide a flavoring for beverages in other lands as well as being used as a stimulant in Africa, and grains of paradise (*Aframomum*), a spicy medicament and flavouring. Of *Cola*, the most important cultivated species is probably *C. nitida.* Kola nuts have been used in Africa from remote times, and there was early trade in them from rain forest regions to the drier regions south of the Sahara. When Leo Africanus first described them in 1556, he aroused a European desire to discover their source. Later, slaves carried the seeds to the New World, and in the 17th century certain Europeans, reaching the West Indies, suddenly discovered the kola tree growing there. Thus, for a long time they believed that it was native in that region.



DESSERT FRUITS OF WEST AFRICA

The akee apple (*Blighia sapida*), above, known as "achee" on the Gold Coast, is a favorite fruit, but only the aril may be eaten with impunity, as the fibrous portion below it is highly poisonous.

The West African plum (*Vitex Cienkowskii*), shown below, is reputed to remedy a lack of vitamins in the diet.

The so-called grains of paradise or melegueta pepper (*Aframomum Melegueta*) of the Ginger family, better known nowadays as "Guinea grains," were formerly exported mainly from what is now the Liberian coast. The small, grain-like, spicy seeds account for the old name, the Grain Coast, given to that part of the coast of Guinea on old maps. Formerly important in European trade, as a spice or medicine, today they are used outside of Africa mainly in veterinary medicine, domestic remedies, and in certain alcoholic drinks. Africans themselves use them in medicine and as a spice in their foods.

The kernels of the fruits of the shea butter tree (*Butyrospermum Parkii*), of the Sapodilla family, are rich in fat (broker's standard 46%). This fat, called shea butter, is commonly seen in markets and is locally used for cooking and other purposes. Generally only the kernels are exported, the shea oil being extracted from them and made into vegetable butter and other products. However, locally prepared shea butter itself is sometimes carried to other countries.

Another valuable oil seed is the African mango, or dika nut (*Irvingia gabonensis*) — which is not a true mango, but a member of the same family to which the tree-of-heaven (*Ailanthus*) belongs. It is cultivated in Lower Dahomey, a variety with a thick edible pulp being sold in the markets in Porto Novo. From the kernels, which contain from 54 to 67% of fatty matter, an almost solid, white or pale yellow fat known as dika butter is extracted. This has been tried out experimentally in Europe in margarine manufacture and as a substitute and adulterant for cocoa butter. For local consumption the kernels are dried and split, ground, heated, smoked, and made into cylindrical masses known as dika bread or Gaboon chocolate, to be eaten with meat, fish, or other dishes.

Edible Fruits and Seeds

Naturally, among man's earliest foods, fruits were of particular importance. In West Africa there are well over 100 species of wild shrubs or trees with edible fruits. These are mainly in the following eight families: Sapodilla (Sapotaceae), Soapberry (Sapindaceae), Dogbane (Apocynaceae), Grape (Vitaceae), Cashew (Anacardiaceae), Spurge (Euphorbiaceae), Madder (Rubiaceae), and Garcinia, related to St. Johnswort (Guttiferae). It is likely that all these and many others were eaten in former days. The African still resorts to those places where the fruits can be gathered as they ripen. He sometimes does some clearing to make the task of collection easier and to encourage the growth of the trees. Then follows a feeling of personal or tribal ownership, depending on the organization of such fruit gatherers. Some trees are thus actually inherited. If the fruit supply increases with this care, the people stay longer and sometimes settle in the neighbourhood. This leads to more clearing and

WILD AND CULTIVATED FRUITS OF WEST AFRICA

The desert date (*Balanites aegyptiaca*), left, is found in dry regions which are subject to occasional floods. The fruits are a nourishing staple, the kernels being used in soup and bread-making and as a source of an edible oil. The pulp of the fruit is edible, bitter-sweet in taste, and is also used, with water, as a drink.

The Assyrian plum (*Cordia Myxa*) is often grown at the edge of the forest by residents of villages. The sticky mucilaginous pulp and also the kernel are edible.

encouragement of growth, also to the special planting of new trees as the land is opened up.

In the savannah forest regions, similar practices are followed with the West African locust-bean (*Parkia filicoidea*) and the shea butter tree (*Butyrospermum Parkii*) — both, incidentally, named after Mungo Park, the great explorer of the late 18th century. Both trees are abundant; there are probably more than seventeen million shea butter trees in French West Africa alone! And the fruits of both are practically everywhere harvested from trees in a semi-wild condition.

Near towns and villages these trees are often better tended and more protected from bush fires, consequently they yield higher crops. Other fruit trees are planted in village areas or specially planted and cultivated on farms. Among them are several species of *Cola*, star-apples (*Chrysophyllum*), the miraculous berry (*Synsepalum* or *Sideroxylon dulcificum*), akee-apple (*Blighia sapida*), hog-plum (*Spondias Mombin*), Guinea grains (*Aframomum Melegueta*), tamarind (*Tamarindus*), dika nut (*Irvingia gabonensis*), bush butter tree (*Pachylobus edulis*), Christ's thorn (*Zizyphus Spina-Christi*), sorrel (*Hibiscus Sabdariffa*), West African ebony (*Diospyros mespiliformis*), Kaffir orange (*Strychnos spinosa*), Assyrian plum (*Cordia Myxa*), *Lannea oleosa,* and various species of *Solanum.*

Many fruits are eaten raw, as dessert fruits, an interesting example being the akee-apple (*Blighia sapida*), named after the famous Captain Bligh of H.M.S. *Bounty.* Only the oily yellow aril is eaten, for the dangerous properties of the fibrous raphe attached to it have long been known in West Africa. The tree is also grown elsewhere, particularly in the West Indies, where its name "akee" closely resembles its Gold Coast vernacular name, pronounced "achee," from which it is probably derived. Although the fruit has been commonly eaten in Jamaica, it was a long time before cases of death resulting from vomiting sickness were traced to akee poisoning.

Another dessert fruit is the West African plum (*Vitex Cienkowskii*), a black fruit with considerable nutritive value, said to counteract avitaminosis, especially in children.

Kernels of the "desert date" (*Balanites aegyptiaca*), which occurs in dry regions where inundations occasionally moisten the ground, are some-

AN EBONY TREE WITH AN EDIBLE FRUIT

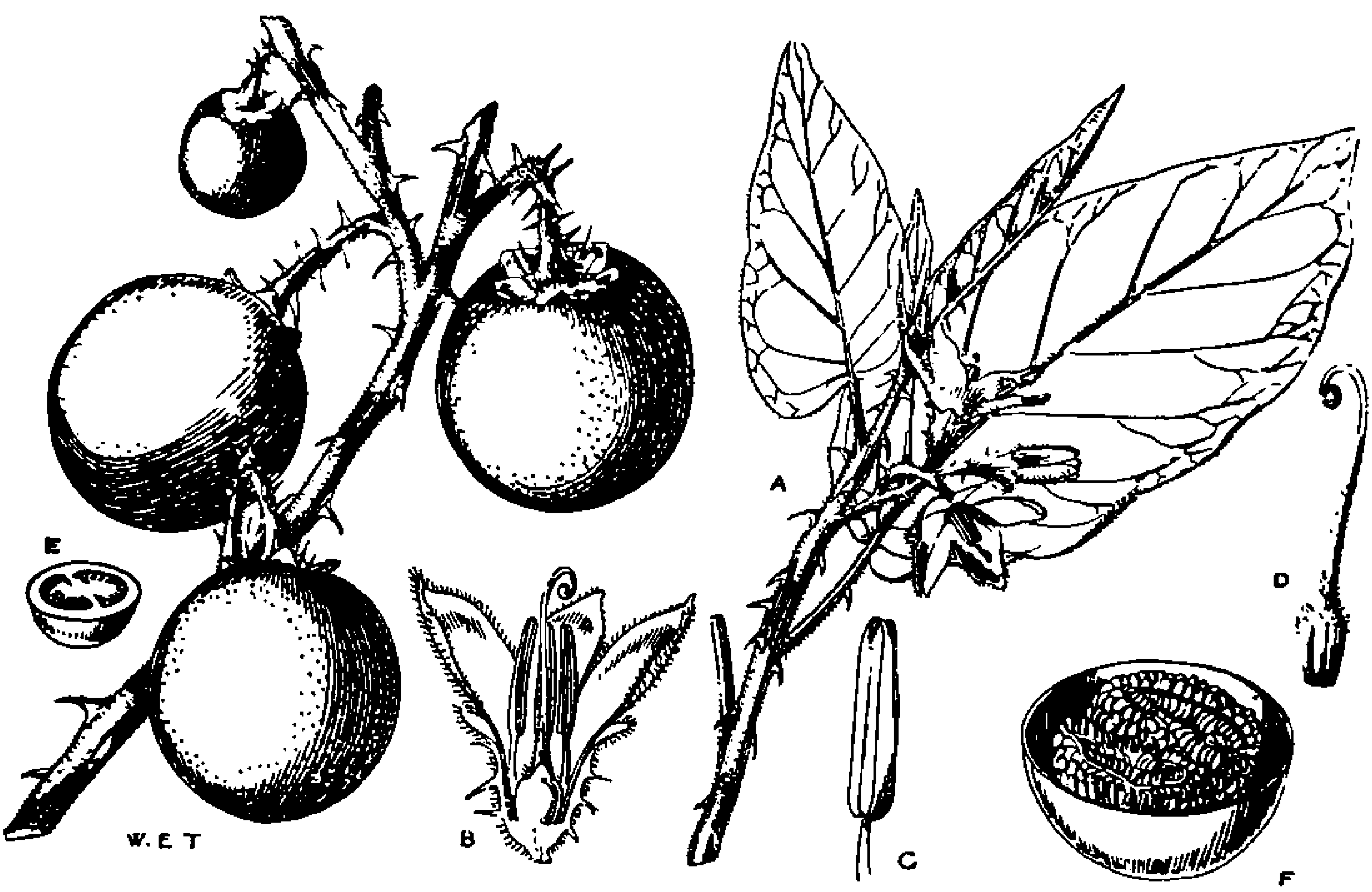
Diospyros mespiliformis, known as "West African ebony," bears fruit which is appreciated by Africans, who sometimes ferment it to make a drink or a sweetmeat. Among its close relatives in other countries are the persimmon, and the other ebonies which are prized as cabinet woods.

times used in making a kind of bread, or they may be eaten in soup. They also provide an edible oil.

Some fruits, such as garden eggs (eggplants), especially *Solanum incanum*, can be eaten only after cooking. Others may be either cooked or eaten raw. The fruits of the hog-plum (*Spondias Mombin*) are sometimes stewed, and the arils of the akee-apple fried in oil or butter before being eaten.

A few fruits, such as the Guinea or African peach (*Sarcocephalus esculentus*) of the Madder family and *Solanum anomalum*, are specially dried for future consumption. Other fruits are pounded and fermented in order to get a preparation which will keep for a considerable period. The best example is the West African locust-bean (*Parkia filicoidea*), the seeds of which are boiled for 24 hours, then pounded, cleaned, and allowed to ferment for two or three days. They are then made into balls, well known in West Africa, where the itinerant Hausa traders barter them, under the Hausa name of DAUDAWA. They are very rich in protein and contain also about 17% of a semi-solid fat. Highly nutritious, they take the place, in some ways, of cheese in a European diet.

In addition, the yellow powdery pulp in the pods of the locust-bean is dried and sold as meal or made into cakes or blocks which likewise keep well. This is a valuable food, which is put into soup or eaten with other foodstuffs. It is composed of roughly half easily assimilated sugars.



A FAMILIAR FOOD PLANT IN ITS AFRICAN GUISE

"Garden egg" is the name applied to the eggplant in West Africa. Its fruits are small compared with the eggplants of American gardens. "Brinjal" is another of its African names.

More African Foods

IN a forthcoming Journal, Dr. Irvine will describe more of the indigenous food plants of West Africa, where he lived for many years before returning to the British Isles in 1940. He will tell of the vegetables—roots, fruits, and greens; of cereals and of the grains and fruits that are used for sweetmeats, and of spices, seasonings, vinegars, and beverages.

Illustrations in this number and the next have come partly from the herbarium and collection of drawings at the Royal Botanic Gardens at Kew, England, and have been made in part with the aid of a grant from King's College (Durham University), Newcastle on Tyne, England. Some of the adapted drawings were made by the author's daughter, Miss Alison Irvine, a student of the Edinburgh College of Art.

While in West Africa Dr. Irvine was on the staff of the Government College of Achimota. During that time he produced "Plants of the Gold Coast" for the Gold Coast Government, wrote text books on local botany and agriculture which were published by the Oxford University Press, and initiated the agricultural and botanical work in the college. After spending a year on the administrative staff for science at Edinburgh University, he is now in London.

The widely distributed *Sesamum indicum* was probably originally tropical African, for it was known in ancient Egypt about the year 1300 B.C. It is now widely cultivated in tropical and subtropical regions as GINGELLY, TIL, or SESAME in the eastern tropics, and as BENISEED in West Africa. The latter name originated in Bambara (Senegal) and Malinke (French Guinea). In West Africa it is grown in pure stands, being mainly cultivated for its seeds, which are rich in oil. They are used in the form of porridge or as thickening in soup, or made into cakes for use on journeys. The leaves are also added to soups. Beniseed is exported from northern Nigeria, the oil being used in margarine manufacture and as a salad oil, or in its lower grades in soap-making. The residue is useful as a cattle cake. Another species, *S. radiatum*, is generally found growing wild, but is sometimes specially cultivated. A closely related plant, *Ceratotheca sesamoides,* often found wild, may also be cultivated, the leaves and seeds both being eaten in soups.

The main oil-producing plant in West Africa is the oil palm (*Elaeis*), which yields a red oil from the outer layer of the fruit. This is greatly used in African cookery, as well as in world commerce — for example, in margarine manufacture — while from the kernels another oil, known as palm kernel oil, is obtained. Kernel oil is used by West Africans as a pomade for the skin, as hair oil, and as a cooking fat, while in world trade also it has various uses.

A lingering sweetness of taste is provided by two of the most interesting wild fruits of the region. One is a tall forest herb of the Arrowroot family (*Thaumatococcus Danielli*), from which the soft jelly-like arils of the fruit are used. The other is the fruit of a shrub or small tree, *Synsepalum* (*Sideroxylon*) *dulcificum*, which occurs wild in West Africa but is often specially planted. The pulp around the seeds causes a persisting sensation of sweetness on the tongue, so that even the acidity of lime juice cannot be recognized, nor the bitterness of quinine. These curious effects may last sometimes as long as one or two hours. Africans use them with certain acid fruits and with palm wine, to sweeten other foods, and even to disguise the taste of stale food. These two fruits are both known as "miraculous berries."

REFERENCES

In introductory portion:

1. Denham (Major), Clapperton (Capt.) and Oudney (Dr.) "Narrative of Travels & Discoveries in Northern and Central Africa," London, 1828. 2: 158-160.
2. Richards, Audrey, "Hunger & Work in a Savage Tribe" 114. London, 1932.
3. Dornan, S.S., "Pygmies & Bushmen of the Kalahari," London, 1925.
4. Kolben, Peter, "The Present State of the Cape of Good Hope" **1**: 202. London, 1731.
5. Schultze, Leonhard, "Aus Nameland und Kalahari" 188-200 ff. 203-205. Jena, 1907.
6. Wittrock, Marion A. & G. L., "Food Plants of the Indians" in Journal of the New York Botanical Garden, 57. March 1942.
7. Talbot, "The Peoples of Southern Nigeria" **3**: 909.
8. Schweinfurth, G. A., "The Heart of Africa" **1**: 266-268. London, 1873.

The main authorities quoted in the remainder of the article are:

Dalziel, J. M. "The Useful Plants of West Tropical Africa," 1937.

Burkill, I. H. "A Dictionary of the Economic Products of the Malay Peninsula," 1935.

De Candolle, Alphonse. "Origin of Cultivated Plants," 1886.

A New Race of Double-flowered Daylilies

By A. B. Stout

THE accompanying illustration shows flowers of a new race of double-flowered daylilies (*Hemerocallis*) that has been obtained by selective breeding at the New York Botanical Garden. The type of flower may be called semi-double, for it is different in character and distinct in origin from the para-double type of flower of the two old clones of *Hemerocallis* that were named KWANSO and FLORE-PLENO.

The character of the semi-double type. In this type of doubleness, as a rule, there is no increase or reduplication of any of the parts of a flower, and especially of stamens and petaloids, as there is in para-doubles.*

* For illustration and description of the para-double type see article on "The character and genetics of doubleness in the flowers of daylilies: The para-double class," by A. B. Stout, in Herbertia **12**: 113-123, issued in 1947.

FLOWERS FROM THREE NEW SEMI-DOUBLE DAYLILY SEEDLINGS

(*About half natural size*)

The pair of flowers at the left, in orange, and at the top, with terra cotta tints, have proved to be among the best selections so far, as the majority of the blooms on these two plants are semi-double. The attractive flowers at the right are reddish in tone, but the plant produces only a small percentage of petaloid flowers. Other promising plants have occurred in breeding plots with larger flowers and in a variety of colorings.

There is only a transformation of one or more of the six stamens into petal-like structures. This process and condition have been called PETALODY and a transformed stamen has been called a PETALOID. In the semi-double flowers the pistil is usually normal in structure and functional in seed-production; in the para-double flowers the pistil is absent or sterile. In both types the three sepals and the primary whorl of three petals are normal in structure and form in having a flat blade that is composed of a midrib and two lobes or wings that form the expanse of the entire petal.

The character of petaloids. In the semi-double flowers of daylilies a petaloid usually has a fragment of an anther near its apex. There are various degrees of petalody. There may be only one lobe or wing along one side of the filament of a stamen. There may be two wings with fragments of an anther at the apex of the common midrib, in which case the face of the petaloid is colored as is the corresponding face of a primary petal. But there are some three-winged and four-winged petaloids whose wings correspond to the main lobes of the normal anther. Each wing of a petaloid has *only one side* that is strongly colored like the face of a petal. When there are secondary wings the colored side of each meets, and is continuous with, the strongly colored face of the primary wing that is adjacent. The secondary wings may be narrow and even reduced to mere ridges.

In many of the flowers of certain of the seedlings the petaloids have blades that are crinkled, and when there are six such petaloids the appearance is as shown in the illustration. Semi-double daylilies of various colors, including terra cotta, have appeared in our breeding plots.

The occurrence of petaloids in daylilies. The writer has been observing petaloids in the flowers of daylilies since 1915. At first sporadic cases were observed on plants of wild origin, on the clones in early cultivation (such as LUTEOLA) and on hybrid seedlings. Later as the breeding work progressed and numerous seedlings were obtained, certain plants had one or more petaloids in each of several flowers that were open at the same time, and there were some flowers in which all six stamens were petaloid. The best of such plants were kept and used in selective breeding.

Most members of the first progenies had no trace of petalody, but those plants on which some flowers had six petaloids were used as parents in further breeding, and special effort was made to obtain seeds from the flowers that had six petaloids — using either pollen of a flower that had only one or two normal stamens or pollen from an incomplete anther on a petaloid. Several progenies have been grown of such parentage. Although most of the seedlings showed no trace of doubleness, several had a noticeable increase in petalody. On three of these plants a large majority of the flowers had six petaloids. Another plant that first flowered in 1947 had ten flowers entirely petaloid; five flowers with five petaloids each; one with four; and one with two Thus far, however, no plant has been obtained which has all stamens petaloid in all flowers.

The selections which have the most petalody, including the three plants whose flowers are shown in the illustration, are being propagated. They have been used in intra-breeding and in cross-pollination with para-doubles (KWANSO and FLORE-PLENO) to the extent that at least a thousand seedlings are being grown. When these produce flowers there will be critical evaluations in regard to possible introductions as horticultural clones.

It is to be recognized that the few plants of the semi-double type here reported are merely a beginning in the production by selective breeding of the double-flowered horticultural daylilies of the future.

Hedgecraft in the British Isles

By C. Romanné-James

IN the United States of America, I am told, you do not plant and grow hedges as extensively as in the British Isles. Therefore, the subject of hedgecraft and of competitions in hedging — dating back more than 100 years — may be comparatively new to you.

While the primary object of a hedge over here is to form a boundary or enclose an area, hedges are found to be further valuable as shelter-belts for stock and crops; also as producers of organic manure and as homes and nesting places for the small birds which destroy caterpillars and innumerable other pests. The hedge forms a characteristic feature of English scenery, particularly in the Midlands, the South of England and in Wales. Edward VIII when Prince of Wales and paying a visit to Breconshire, remarked that he had never seen better hedges anywhere than in that part of the country — his own Wales.

When a hedge is to be made, a row of bushes and small trees is first planted and allowed to take root firmly. Then this skeleton fence is trimmed, staked and "layed", until it forms a strong barrier. The method of "laying" a hedge is this:

When a tree is planted in the ordinary way, it naturally grows upright. But in a hedge, upright trees are neither required nor desirable. So, when the sapling is sufficiently grown to train — say in six, eight or ten years — it is "layed." This means that it is cut so that its branches may be bent and trained to grow to the right or left, horizontally. They are twisted in and out of the stakes and of other branches, and thus they form the best part of the hedge. It is often as long as ten years before trees and shrubs that are planted to make a hedge are ready to lay and fill in.

Trees and bushes employed for the purpose of hedge-making are many and varied. The only hedges comprised solely of one kind of tree are those to be found in gardens and parks, where ornamental boundary plantings are made of, say, yew, holly, sweet-briar, syringa, or other more or less formal woody plants. All farm and field hedges are made up of a variety of trees, such as thorn, hawthorn, elder, beech, maple, etc., according to the kinds which grow best in the district.

Each has its own virtues. Blackthorn, loved of the gypsies, makes a good hedge, though it is too apt to run to root. Hawthorn, a word derived from the old English for "hedge-thorn," is perhaps the most popular because of its amenability to pruning, its prickly nature, and the closeness of its growth which makes it an effective barrier. The same may be said of holly. Hazel — especially young trees produced from suckers — is tough yet pliable and for this reason much employed for

C. ROMANNE-JAMES, who in private life is Mrs. H. C. Aylen, a Fellow of the Royal Society of Arts, writes regularly for a number of British magazines, among them *The Guild Gardener,* in which a shorter version of the accompanying description of "Hedgecraft in the British Isles" first appeared. She is contributing this article to the Journal of the New York Botanical Garden, she writes, "as a token of the friendly feeling I, and so many others in this country, have toward the U. S. A."

Besides being active in numerous horticultural organizations, Mrs. Aylen is a member of the Society of Authors and is the author of a book entitled "Herblore for Housewives."

hedge-making in Wales. The purple willow, too, is a favorite hedge-plant in country places because, the bark being bitter, no rabbit or other destructive creature will nibble a way through it. Other useful trees and bushes for hedging are hornbeam, beech, cherry-plum, field maple and the sycamore (*Acer pseudo-platanus*) — the last because of its robust nature and reputed long life. My own herb garden is enclosed with a hedge of *Lonicera nitida* or Himalayan honeysuckle, which is quick-growing, but has to be continually cut to keep it tidy and within bounds.

Hedge-stakes, to strengthen the fencing, are inserted down the center in numbers of about twenty-one to every fourteen yards, in order to support the hedge and keep it shapely. They are made of oak poles, larch poles, or any other available wood. Each pole is cut into about three pieces for this purpose, according to its length and the length required. No cord or anything of the kind is used to hold the hedge in place, though the word "tying" is employed to signify skillful twisting in of the ends of dead wood and tree branches.

In Breconshire, Wales, where I am for a time domiciled, hedging competitions are held every year, as they have been for more than 70 years in this district. The entrants, all young fellows, are the sons of farmers or farm-labourers who have grown up in the neighborhood, and from the age of fifteen have learned to take part in the farm work, such as milking, ploughing, hedging, sheep-shearing and the training of sheep-dogs to herd in the sheep. Incidentally, competitions in *all* these farm activities take place annually in spring or autumn in many country places in the British Isles.

A hedging contest does not concern itself with the making of a *new* hedge. On the farm chosen for the contest, hedges which have gaps or need extensive repairs are selected and 14 yards are marked off for each candidate, according to the number of entries. Each 14 yards is numbered and each candidate draws a number, which determines on which piece of hedge he shall work.

The judges, who watch and time the competitors from beginning to end, give points for banking up the hedge, for staking, tying and for the "laying in," or filling up of gaps with what is known as "dead wood" selected for the purpose. Dead wood is wood which has been cut in long lengths or sticks, has no roots, of course, and therefore does not grow. Pliable dead wood is used in the case of hedge-making to thread in and out to fill in gaps and help support the layed branches.

On a recent occasion, when I was invited to watch a competition — the seventieth in the district —, the lads concerned had a special incentive to do their very best, to show off all they knew, for a camera-man arrived at the farm to take photographs for a film. The competitors were shown at work; a piece of newly layed hedge was photographed; and finally the judges were pictured explaining, with illustrations, why full points were given to the winner and where and why others had failed in certain of the necessary operations.

The record time for laying fourteen yards of hedging, as here described, was five hours. Full marks were acquired and the successful competitor won the championship of the district as an expert hedger, in addition to congratulations from the judges.

If those lads who "hedged" were thrilled at the idea of being filmed, I, as an onlooker, had the same feeling, but for another reason. On a lovely day, in ideal and peaceful surroundings, I had been allowed the privilege of watching a country craft of long standing, performed with patience, skill and ingenuity. I had seen seven or eight lads, keen as knife blades, working to the best of their ability. And I had also learned that there is more to the making of a hedge than at first meets the eye.

The Role of Mulch In Forest and Garden

By R. R. Fenska

EVERY forester knows the important function which the mulch in the forest performs in the silvicultural aspect of his profession. This blanket of debris which covers the ground consists of the accumulated and partially disintegrated litter in the forest: leaves, bark, and twigs. Mulch retards evaporation and helps to maintain the degree of soil moisture that is required for plant growth. It insulates the ground against extremes of heat and cold and thereby maintains a more uniform condition for activities of the soil fungi, bacteria, and microscopic forms of animal life which are the factors that break down the litter into humus which becomes incorporated in the soil.

The humus, in turn, improves the soil texture and its physical condition; it makes the soil mellow and porous and enables it to retain moisture during a drought. Also, as the litter and forest debris decay, the mineral nutrients and nitrogen which have been withdrawn from the soil by the trees and plants in their growth are returned to it. Thus the fertility of the soil is maintained.

On a hillside or slope a mulch will also prevent erosion or washing of the soil. When trees are growing on a lawn an excellent mulch may be maintained without its being unsightly, with the help of a ground cover, such as pachysandra. As the leaves accumulate underneath the tree they are covered by the pachysandra and thus made inconspicuous. This is one of the best means of maintaining healthy shade trees on well kept lawns. When the trees are fed, the holes made for applying the tree food may be left open and yet remain out of sight.

A mulch is as important to perennials in the home garden as it is to forest trees. In the garden it also greatly reduces, or even eliminates, the growth of weeds. Those that do come up are easily pulled out of the loose-textured soil. Many of them succumb for lack of light and air.

There are other materials besides forest litter which may serve as a mulch. Some of those in common use are peat moss, sawdust, hay or straw, animal manures, or specially prepared paper or burlap held down on the ground over the plants during the winter and early spring. The latter are usually left on the ground until they disintegrate.

Snow is an excellent mulch when it really covers the plants that need protecting. Here is an example of its effect.

In 1911 or 1912 the state forester of Wisconsin set out several thousand transplants of western yellow pine on the cut-over and burned-over areas in the state reserve. The ground always freezes early up in northern Wisconsin and the freezing is followed by quantities of snow.

The first two years, while the little trees were completely covered with snow, they came through the winter in good condition. When the snow melted in the spring the pine needles looked green and healthy. But during the third year the trees had grown so much that the snow of that winter did not entirely cover them. Their tops stood well above the snow-line.

The following March when the snow began to disappear it was still apparent where the snow-line of that winter had been. Every pine in that plantation began to show a red top where it had been above the snow-line, while the rest of the tree below the snow-line was as green as a healthy pine could look. The ground had frozen hard before the snow came. As long as the snow protected the tops, well and good, but when they were exposed to the winter winds they could not replace the moisture evaporated from the pine needles when their roothairs were in hard frozen ground. Later, as those roots reached down below the frost line, some of those pines finally became established. Others died out because of the injury known as "winter-killing," which is the cause of more damage to evergreens in the northern latitudes than any other factor.

If there is not sufficient snow in a region, a mulch is highly desirable for evergreens, for their leaves keep on functioning all winter while the deciduous trees rest; but they simply can not get the water that they need when the soil is a solid frozen mass. Whenever the sun shines, water is constantly being evaporated from their ever-active green leaves. If the roots can not replenish this water, serious burning and eventual death of the branches' extremities will result. If a mulch is applied early enough to keep the ground from freezing at the level of the feeding roots, it may save the life of an evergreen tree or shrub.

Deciduous trees also sometimes suffer when there is no mulch on the ground. Frozen soil is responsible for the actual "freezing to death" of many feeding roots on shallow-rooted trees, such as beech. Lack of debris on the ground exposes the soil to all the unfavorable climatic activities, such as alternate freezing and thawing with resultant heaving of the soil. Heaving tears loose the root-hairs of the plants and exposes them to the severe elements of late winter and early spring.

There are those who maintain that a mulch should be applied only after the ground is frozen over. The argument is that the mulch is not to keep plants warm but to keep them cold. They recommend that you permit the ground to freeze hard enough to bear a team and a wagon. But this is not nature's way of using mulch. Nature puts it down in the fall when the foliage drops and keeps it there until it has disintegrated to form the humus in the soil. It is true that a mulch placed after the ground is frozen will keep it frozen during the early spring when alternate freezing and thawing may heave small plants or recently planted trees out of the ground and expose their roots. But this is one of the special circumstances where this practice may be of some benefit.

When there are bulbs or small fruit trees or ornamentals to be protected, it is again advisable to apply a mulch after the ground is frozen. An early mulch would invite moles to burrow in the nice soft warm earth beneath, making tunnels which the little field mice would use to gain access to the tender bulbs and roots that they like for winter fare. I have seen small fruit trees and dogwoods and magnolias girdled at the base by field mice gnawing away the tender bark during the winter months under the protective cover of the mulch at the base of the tree. And I have known of tulip bulbs that have never sprouted because the mice, running through mole tunnels, feasted on them over winter.

Therefore, a hard and fast rule can not be given that will hold good for every condition. Sometimes an early mulch would be the logical procedure, while in other instances it may be better to let the surface freeze before a protective covering is applied.

On my strawberry beds I have used a perennial mulch of grass cuttings for several years with good results. Each spring the mulch of the previous year is forked into the top layer of soil before any new material is placed on the beds. The result has been a friable soil with a good texture, almost free of weeds.

In the forest we grow the "King of the Plant World" successfully with a natural mulch. We would do well to imitate this method in the production of our agricultural and garden crops.

NOTICES AND REVIEWS OF RECENT BOOKS

Scientist's Point of View On Tobacco Culture

THE PRODUCTION OF TOBACCO. Wightman W. Garner. 484 pages, illustrated, indexed. Blakiston, Philadelphia, 1946. $4.50.

As director of tobacco investigation of the Bureau of Plant Industry, Soils and Agricultural Engineering of the United States Department of Agriculture from 1908 until recently, Dr. Garner has long been in close touch with improved methods for the production of tobacco. This volume may therefore be regarded as the work of a specialist. No such comprehensive study has appeared since 1897 when J. B. Killebrew and Herbert Myrick published their valuable "Tobacco Leaf: Its Culture and Cure, Marketing and Manufacture."

In general, "Tobacco Leaf," which is chiefly the work of Killebrew, might be termed a summation of the body of knowledge on the production of tobacco amassed by farmers, while Dr. Garner's study relates chiefly to the work of scientists along the same lines.

As a result this volume represents a new departure. It is therefore unfortunate that Dr. Garner did not include information relative to the work of scientists of the United States Department of Agriculture. A chapter on the methods of Milton Whitney, an energetic disciple of Ira Remsen and the first Department of Agriculture scientist to outline a program for improving the production of tobacco, would have enlivened a work obliged by its very nature to be heavy.

In Part I Dr. Garner describes the botanical characteristics of the tobacco plant, explains the technical classification of leaf tobacco, and gives the historical background on which the tobacco industry rests. Part II is concerned with applied production of the different classes and varieties of leaf tobacco and should be of especial interest to farmers. Scientific aspects of tobacco culture, including the findings of agronomists, biochemists, physiologists, and geneticists, are summarized and explained in Part III.

To the scientifically untrained mind o the reviewer some of the explanation in Part III are slightly hazy, althougl the general conclusions are clear anc definite. The assembling of the essentia features of tobacco production, togethe with analyses of specialized studies intc one convenient volume, has placed thos interested in the subject in great debt to Dr. Garner.

Some of the author's views in regard to the historical background of the tobacco industry seem doubtful. There is no clear statement that the colonists at Jamestown failed to become successful in the production of tobacco until after they had obtained seeds of *Nicotiana tabacum* from South America as a substitute for the undesirable *Nicotiana rustica,* native to the Jamestown area. It is doubtful that the early production of bright tobacco was "practically stopped" by the Civil War as Dr. Garner maintains (p. 42); effects of the war served rather to shift the area of production southward. The statement that the cigarette machine was invented in 1872 and that several years were required to perfect it (p. 468) is misleading. Undoubtedly many cigarette machines were invented during the 1870's and numbers of them were not patented, but the Bonsack machine, which was first to influence production, did not appear until 1880. Five years were then required to render it efficient.

The chief value of cloth covers on seed beds lies in preventing attacks of flea beetles rather than in conservation of warmth and moisture, as Dr. Garner seems inclined to think (pp. 126-127). One variety of flue-cured leaf cited as noteworthy (p. 74), "Pinckney Arthur," received general condemnation from leaf buyers during the First World War and was soon forced off the market. These and similar small errors in the historical background of the industry, however, are relatively unimportant in a work concerned with the production of leaf tobacco.

Unfortunately the author's style leaves much to be desired. Split infinitives

abound; adjectives are frequently and most peculiarly used as nouns; awkward phraseology often renders meaning obscure; and repetitions of portions of sentences are tiresome and unnecessary. There are many typographical errors and other instances of inadequate editing.

The bibliography is generally excellent although such works as the following are omitted: The study by Killebrew and Myrick, J. C. Robert's "Tobacco Kingdom," and Jerome Brooks, "Tobacco, Its History Illustrated by the Books, Manuscripts and Engravings in the Library of George Arents, Jr." Obviously all of them were consulted. In the bibliography not only did the stout old conquistador, Bernal Díaz del Castillo, who accompanied Cortés in 1519, have his name misspelled but also an article on cigarette tobacco which appeared in 1936 is attributed to him (p. 490)!

NANNIE M. TILLEY,
East Texas State Teachers College.

Physician, Patriot, Naturalist

THE SELECTED WRITINGS OF BENJAMIN RUSH. Edited by Dagobert D. Runes. 433 pages, illustrated, indexed. The Philosophical Library, New York, 1948. $5.

Since Benjamin Rush is described as "a great physician and naturalist," it is disillusioning to learn that he wrote only one paper of botanical importance and disappointing to find that this one, his noteworthy account of the sugar maple in the United States, is not included in this volume of selected writings. A man with his alert power of observation and ability to express himself clearly might have made many a valuable contribution to natural science in America, outside of his many papers emanating from his practice and teaching of medicine.

His influence in this field, however, was not small; but his name was known especially in political and what came to be sociological fields, particularly at the time leading up to the American Revolution.

His discourse on the sugar maple, an original copy of which is in the New York Botanical Garden's library, was written as a letter to Thomas Jefferson and was "read in the American Philosophical Society on the 19 of August, 1791, and extracted from the Third Volume of their Transactions, now in the Press."

CAROL H. WOODWARD.

For All Saintpaulia Fans

THE AFRICAN VIOLET. Helen Van Pelt Wilson. 191 pages, illustrated, indexed. M. Barrows & Co., New York, 1948. $2.50.

This is the book for which all African violet fans have long been waiting.

There has been so much contradictory information published on the subject, that growers will warmly welcome a book by a noted author which contains reliable information and explicit cultural directions.

By following these directions, it will be possible for every housewife to have a display of Saintpaulias that is second to none.

The book is well illustrated with drawings of many varieties and contains a brief description of flower, leaf and plant forms. Many will be able to name their plants after a study of these chapters.

I especially like the listing of the different sources of supply; also the clear-cut directions given for packing and mailing plants and leaves. Many people do not know that leaves, if properly packed, can travel from one side of this continent to the other, and produce new plants as quickly as freshly cut leaves.

Plant pests and remedies are fully covered in another chapter; you will also find information on propagation, soil mixtures, fertilizers, methods of combating insects and the various diseases that affect these plants.

I was much disappointed that the different varieties were not photographed in color, as color is the keynote in classifying African violets.

There is a variety of useful information on all phases of culture contained in this book, which will deserve a place on every flower lover's book shelf—whether the grower is a beginner with African violets as a hobby, or a specialist interested in developing new varieties and propagating them for profit.

JESSIE J. CRAWFORD.

(With an article published last December, Mrs. Crawford was winner of the first award in *Home Garden* magazine's African violet contest.)

Rose-Growing Made Easy

ROSES FOR EVERY GARDEN. R. C. Allen. 218 pages, illustrated, indexed. M. Barrows & Co., New York, 1948. $3.50.

There is no doubt that the rose has universal appeal and so we welcome this book which writes of this favorite flower. Anyone may read this book with much profit but it is especially useful for the less experienced amateur since it aims to show that "Growing roses quite well is an easy business."

The author has covered his subject very well. Opening chapters cover the various classifications of types of roses, making plain their differences. Adequate lists of varieties in each class are given. The cultural requirements such as location, soil preparation, planting, watering, fertilizers, pruning and winter protection, disease and insect control are clearly discussed. Additional chapters contain information on propagation and hybridizing—good encouragement for the amateur. Included also are helpful points for the gardener who takes pleasure in exhibiting at flower shows and for the gardener who likes to use his roses cut for decoration. The color plates and black and white line drawings add much to the enjoyment and understanding of the text.

ALICE B. DOSCHER.

Legend Brought to Life

JOHNNY APPLESEED: A VOICE IN THE WILDERNESS. Edited by Leslie Marshall. 76 pages. Swedenborg Press, Paterson, N. J., 1948. $1.25.

John Chapman, the man so dwarfed by his legendary shadow, died in 1845. As a centennial tribute, authorities on his life have prepared this short account of the man—a pioneer and eccentric evangelist—a dedicated man, who moved West with the frontier through the wilderness of Ohio, Indiana and Illinois.

Whatever else, John Chapman was a nurseryman by trade. He did not scatter seeds helter-skelter, but set out acres of nursery stock. Moving west, Chapman left an agent to sell his stock or he would return periodically to care for his seedlings. Chapman was alert enough to the westward movement to get his nursery started one step ahead of settlers, but as an itinerant preacher, the commercial aspects of his nurseries were not uppermost in Chapman's mind. His nickname, Johnny Appleseed, became a byword during his lifetime and the Appleseed legend grew as men moved westward.

Few have made as unique and unselfish a contribution to our country in its gawky years as this humble preacher who won men's goodwill with his apple trees.

HERBERT S. ZIM,
Port Washington, N. Y.

A Hundred Ferns

GUIDE TO EASTERN FERNS. Edgar T. Wherry. 252 pages, illustrated, indexed. University of Pennsylvania Press, Philadelphia. Second edition, reprinted 1948. $2.

This useful little book is again available. Amateurs everywhere have valued its authoritative text and instructive comments. Each fern (about 100 species in all, including the fern-allies) is illustrated by line drawings (some of which were redrawn for the second edition) which are often somewhat stylized, but which do permit the ready identification of specimens. Identification is also facilitated by a 19-page key, omitted in the first edition.

C. V. MORTON,
Smithsonian Institution.

Notes, News, and Comment

President. During the meetings of the newly organized American Institute of Biological Sciences in Washington, D. C., in mid-September, Dr. W. H. Camp was elected President of the American Society of Plant Taxonomists. Others from the Garden's staff who attended the botanical meetings included Drs. H. A. Gleason, F. W. Kavanagh, H. W. Rickett, D. P. Rogers, and F. J. Seaver.

Assistant. Richard S. Cowan came to the Garden September 1 from the University of Hawaii as Technical Assistant, to carry on research on tropical plants while working for a Ph. D. degree at Columbia University. Mr. Cowan is a graduate of Wabash College. During the war he served with the "Seabees" on Tinian where he did some botanical collecting. Later he obtained his Master's degree (1948) from the University of Hawaii, meanwhile collecting plants on several of the Pacific Islands.

Herbarium Staff. Joseph Monachino, who has been botanist for Merck & Co., working at the Garden under the supervision of B. A. Krukoff, Honorary Curator of Economic Botany, since 1941, has been named Associate Custodian of the Herbarium at the New York Botanical Garden, effective September 1. For several years previous to his appointment with Mr. Krukoff, he worked in the Garden's herbarium. Mr. Monachino is co-author with Mr. Krukoff of extensive papers on the genus *Strychnos.* He has also published in *Phytologia, Lloydia, Torreya, Tropical Woods, Brittonia,* and the *Caribbean Forester,* describing new species of plants from Brazil, Venezuela, Colombia, Ecuador, Peru, the West Indies and Mexico. He is a life member of the Torrey Botanical Club, for which he has been leading field trips for more than ten years.

Visitors. Brother Alain of the Colegio de la Salle in Havana came to the Garden August 17 to study Cuban plants in the herbarium in preparation for a second volume on the Flora of Cuba.

Dr. N. Prasad, a graduate student in plant pathology at the University of California, visited the Garden August 6 Before coming to this country he was mycologist for eight years at the Agricultural Research Station at Sakrand in Sind, and is now returning to India.

Mrs. Edward A. Belsterling (Louise Babcock) of Dallas, Texas, a grandniece of the botanist John Torrey, was a visitor at the Garden August 20. Her mother was a daughter of John Torrey's brother Edward.

Vladimir C. Asmous, now in the Slavic department of the Harvard College Library at Cambridge, spent a week at the Garden in mid-September investigating Russian botanical literature of the past ten years.

Maxwell S. Doty of Northwestern University worked on the Clavariaceae at the Garden for ten days in August.

Polypores of Washington were studied at the Garden for a week by William Bridge Cooke of Washington State College at Pullman.

Among other late summer visitors were Mr. & Mrs. Kendal Morton of Coral Gables, Fla., authors of "Fifty Tropical Fruits of Nassau;" Lafayette Frederick of Rhode Island State College, a former student of Dr. Donald P. Rogers at the University of Hawaii; F. G. Walsingham of the Atkins Garden and Research Laboratory at Cienfuegos, Cuba; Wayne E. Manning, Bucknell University, Lewisburg, Pa.; Ronald J. Mann, University of Florida; Geneva Sayre, Russell Sage College; Charles H. Driver, Fulton County Botanical Garden, Atlanta, Ga., William Irwin Illman, National Research Council, Ottawa; and two students, Paul Wilson Pitman, University of North Carolina, and Rodolfo Moreno from Mexico City, now in the agronomy department at Cornell University.

Poliomyelitis. Drs. William J. Robbins, I. N. Asheshov and Robert S. de Ropp attended the first International Poliomyelitis Conference at the Waldorf Astoria Hotel in New York July 12-17.

Volunteer. Ruth P. Ehrlich, a student at the University of Vermont, worked as a volunteer in the library, herbarium and horticultural department at the Garden during July and August.

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station, use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue bus No. 41 to Bedford Park Boulevard.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $15.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. $6.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner. 1935. Second edition 1947. $2.

The Bahama Flora, by Nathaniel Lord Britton and Charles Frederick Millspaugh. 695 pages. Descriptions of the spermatophytes, pteridophytes, bryophytes, and thallophytes of the Bahamas, with keys, notes on explorations and collections, bibliography, and index. 1920. $6.25.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50. Foreign postage extra.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Plants of the Holy Scriptures, by Eleanor King, with a check-list of plants that are mentioned in the Bible, each one accompanied by a quotation. Revised from the Journal of March 1941. 23 pages, illustrated. 1948. 25 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal, 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

Catalog of Hardy Trees and Shrubs. A list of the woody plants being grown outdoors at the New York Botanical Garden in 1942, in 127 pages with notes, a map, and 20 illustrations. 75 cents.

Succulent Plants of New and Old World Deserts by E. J. Alexander. 64 pages, indexed. 350 species treated, 100 illustrated. Bound in paper. 1942. Second edition 1944. 50 cents.

Review of Juniperus chinensis, et al by P. J. van Melle. A study of the many varieties and forms of *Juniperus* which have been commonly included in the concept of *J. chinensis.* 108 pages, illustrated, bound in paper. 1947. $2.

Periodicals

Addisonia, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twenty-second volume. Published irregularly. Subscription price, $10 a volume. Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1.50 a year; single copies 15 cents. Free to members of the Garden. Now in its 49th volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.50 each. Now in its fortieth volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers published in co-operation with the American Society of Plant Taxonomists. Subscription price of volumes 1 through 5, $5 a volume ($4 to members of the Society). Now in its sixth volume. Price, $7.50 ($5 to members of the Society).

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. 96 parts now issued. Not offered in exchange. Prices of the separate parts on request.

Contributions from The New York Botanical Garden. A series of technical papers reprinted from journals other than the above. 25 cents each, $5 a volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Contents and prices on request.

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

Vol. 49
No. 587

NOVEMBER
1948

PAGES
249 — 272

NOVEMBER EVENTS AT THE GARDEN

Courses of Study

Designing the Home Grounds
Second term, Nov. 11 - Dec. 16 — Five sessions, Thursdays, 3 - 5 p.m.
Instructor: *Alice L. Dustan* $7.50

Free Saturday Programs

3 p.m. in the Lecture Hall

Nov. 6 ***What Good are Insects?*** — *Brayton Eddy*, New York Zoological Society

Nov. 13 ***Fall Schedule for the Conscientious Gardener*** — *Edward J. O'Keefe*, Instructor in Gardening Practice

Nov. 20 ***How and Why Wood Decays*** — *Raymond R. Hirt*, N. Y. State College of Forestry

Nov. 27 ***Science and your Daily Food; How Beans Grow; Kindly Fruits of the Earth*** — A motion picture program

Dec. 4 ***Evergreens for Christmas Decoration*** — *Ann Hagan*, Florist

Members' Day Programs

3 p.m. in the Members' Room

Nov. 3 ***Hemlocks in Variety*** — *Charles F. Jenkins*, The Hemlock Arboretum, Philadelphia, Pa.

Dec. 1 ***The Past and Present in American Wild Flower Illustration*** — *Samuel Gottscho*, Photographer

Conservatory Displays

10 a.m. to 4 p.m. daily

Chrysanthemums and other autumn flowering plants will be on view in the conservatory beginning in early November. This exhibit will be changed throughout the winter season as new plants from the propagating houses are ready for display.

Driftwood Sculpture
In the Museum

Roots and branches in the form of animals, birds, and human figures comprise the principal exhibit in the Museum Building during November. Washed up on the shore of Candlewood Lake, at Hemlock Ridge, near New Milford, Conn., the figures were collected by Yves and Rosamund Tinayre while they were residents there. No carving has been done on these unique and life-like figures. They have been mounted on rough blocks by Mr. Tinayre, and are exhibited in the form in which they were found on the shore.

The exhibit, which opens Oct. 31, will continue through December 3.

The illustration on the cover shows one of the wood sculptures in the current exhibit.

TABLE OF CONTENTS

NOVEMBER 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription $1.50. Single copies 15 cents.

JOURNAL

of

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VOL. 49 NOVEMBER 1948 NO. 587

Oncoba—The "Chic" of Araby

By Edwin A. Menninger
Stuart, Florida

HUNDREDS of wild white "roses" abloom on a single plant are the glory of a bushy Arabian tree being widely planted in the warmer parts of Florida and California. Its name — *Oncoba* — is, like the plant itself, of Arabic origin. The specific name of *spinosa* is in reference to the many sharp two-inch thorns in the leaf axils. The tree grows also in Nigeria, Kenya, Cameroons and Northern Rhodesia, often up to elevations of 4,000 feet.

Evergreen in favorable situations, *Oncoba* is deciduous when touched by temperatures near freezing. It withstands some cold but it is not hardy and does not survive the winters even in north central Florida. Its dark green, cherry-like foliage, often a beautiful wine-red when young, contrasts sharply with the light gray bark of the trunk.

In April and May comes the abundance of solitary, white, scented flowers, three inches across, with numerous yellow stamens, not unlike large single white roses or camellias. In Nigeria[1]* the tree is called the "wild white rose," though it belongs rather to the Flacourtia family and, among cultivated materials, has almost no relatives in the Temperate Zone.

The flowers, which grow in profusion along the leafy boughs, stem from the under side of the young branches and turn sunward to last only a day before the petals shatter. But new blossoms are always opening, and for a month or six weeks the succession of flowers on what is facetiously called "the fried egg tree," makes it a center of attraction in the garden.

The Division of Plant Exploration and Introduction of the United States Department of Agriculture has introduced *Oncoba spinosa* into this country and made it available to growers.

*A list of references will be found at the end of the article.

Flowering branch of *Oncoba spinosa,* the rose-like blooms of which measure three inches in diameter.

Oncoba blooms at 6 feet and rarely grows more than 10 feet high, although a veteran specimen in Palm Beach stands 20 feet high and measures as much in diameter. It also grows as a shrub, and as a bushy background plant it is exceptionally good in the large yard. Blossoms continue sporadically all through the year, though they are not to be compared with the over-all display of spring.

The fruits of *Oncoba* are smooth, 2½ inch spheres, flattened at top and bottom like those of the calamondin (*Citrus mitis*). They have very hard shells of a rich red-brown color, often with a sculptured surface or longitudinal rib-like markings and, in Africa, they are sometimes polished, hollowed out and used for snuff boxes [2,4] or sealed again with a few pebbles placed inside to become a child's rattle [3]. The native name for *Oncoba* in the Gold Coast means "snuff-box tree [2]."

Each fruit contains about fifty small seeds in a pulp which Macmillan [5] says is considered edible, but famine must have been stalking the land when this report was made. Britton [6] says the seeds contain chaulmoogric acid but this is flatly denied by Dalziel [3]. The seeds do yield 37.6 percent of a drying oil suitable for paint but the difficulty of separating the small seeds from the pulp is an unfavorable factor.

The leaves of *Oncoba spinosa* are slightly serrated. *Oncoba Routledgei,* which is more commonly planted in California, has deeply serrated leaves and is probably only a variety of *O. spinosa.* There are about 25 other species of *Oncoba* in Africa and tropical America.

LIST OF REFERENCES ON ONCOBA SPINOSA

(1) Kennedy: "The Forest Flora of Southern Nigeria."
(2) Irvine: "Plants of the Gold Coast."
(3) Dalziel: "The Useful Plants of West Tropical Africa."
(4) Dutton: "The Planting of Trees and Shrubs in Northern Rhodesia."
(5) Macmillan: "Tropical Planting and Gardening."
(6) Britton & Wilson: "Botany of Porto Rico and the Virgin Islands."

Flowers Dried in Borax

Notes After Eight Years of Experimentation

By Frances R. Williams

SINCE before 1940, Mrs. Frances R. Williams of Winchester, Mass., has been preserving garden flowers and New England wild flowers in borax and other powders in such a way that many of them have kept their natural form and some of them have even kept their color over a period of years. A complete description of Mrs. Williams' method was given in the Journal for June 1943. Below is a report of her success—or lack of success—with 120 different kinds of plants with which she has worked. They are listed alphabetically by common name, with the botanical name following.

THE plants listed below have been dried in their natural form during the last eight years. Most of them were dried in powdered borax, being placed in a shoe box or similar container and kept completely covered for three weeks. Plants containing a large amount of moisture in their cells, such as mushrooms and skunk cabbage, require six weeks in the powder before being removed.

The powder is sifted in and around the plant with the fingers guiding it where wanted, first banking the flower with it firmly around the outside before putting powder into the flower. It is surprising how small an amount of powder can flatten out a flower and make it lose its nice cup shape.

After the flower is dried, the powder should be removed with just as much care. Again, fingers are the most efficient implement, quickly telling you when you are in contact with a dried leaf or petal. A box that opens at the corners lets the powder fall out along the sides, and it is then easier to move away the rest. The box can be tied into shape again to use for the next specimen.

The preservation of flowers by drying them in their natural form can serve not only as a useful hobby with numerous applications, but can become an interesting project in occupational therapy, particularly when small flowers are dried for decoration of little two-inch boxes containing lavender or pot-pourri.

The color of most flowers fades to some extent; all specimens are fragile in the dried state. Some are rather ghost-like in appearance; but many of them hold their looks for two or three years, often much longer. At present I am attempting to soften the appearance of the dried plants and at the same time to kill the carpet beetles which sometimes infest them, by spraying them with an insecticide plus glycerine, but I have had no success. I would like to know what to use. In the meantime, moth balls and a sprinkling of borax placed with the specimens that I have put away for reference does an excellent job of keeping carpet beetles away.

My list of successes and failures in drying plants in their natural form follows. The division into excellent, good, fair, and poor is based especially on the appearance of the dried plant. Does it look nearly like a fresh flower, and are the color and shape good? Some are still pleasing in appearance after six and eight years.

Excellent

Absinth leaves (*Artemisia Absinthium*)
Anemone, French (*Anemone coronaria*)
Bachelor's buttons (*Centaurea Cyanus*)
Butter-bur (*Petasites fragrans*)
Camellia (*C. japonica*)
Coltsfoot (*Tussilago Farfara*)
Coxcomb (*Celosia cristata*)
Dogwood, Japanese (*Cornus Kousa*)
Ferns (*Osmunda cinnamomea*) sterile and fertile fronds; also young 6-inch fronds of the ostrich fern (*Pteretis nodulosa*)
Fuchsia (*F. hybrida*)
Gentian, Closed (*Gentiana Andrewsii*)
Gladiolus, dark purple (*G. hortulanus*)
Glory-of-the-snow (*Chionodoxa Luciliae*)
Goldenrod (*Solidago nemoralis*)
Grape hyacinth (*Muscari botryoides*)
Guinea-hen tulip (*Fritillaria meleagris*)
Horse-chestnut buds (*Aesculus Hippocastanum*)
Delphinium (*D. cheilanthum* var.)
Lotus leaves (*Nelumbium Nelumbo*)
Marigold, African (*Tagetes erecta*)
Miltonia Orchid (*Miltonia* sp.)
Mountain laurel (*Kalmia latifolia*)
Mullein leaves (*Verbascum Thapsus*)
Mushroom, Oyster (*Pleurotus ostreatus*)
Mushroom, Shaggy-mane (*Coprinus comatus*)
Peony, single (*Paeonia officinalis* or *albiflora*)
Pond-lily (*Nymphaea odorata*)
Prince's feather (*Polygonum orientale*)
Ragweed (*Ambrosia elatior*)
Squill, Siberian (*Scilla sibirica*)
Snapdragon, clear pink and yellow (*Antirrhinum majus*)
Stocks (*Matthiola incana*) (Excellent shape but colors fade.)
Verbena, pink (*V. hortensis*)
Waterlilies, tropical (*Nymphaea* vars.)
Witch-hazel (*Hamamelis virginiana*)

Good

Balloon-flower (*Platycodon grandiflorum*)
Butter-bur (*Petasites japonica*)
Actinidia (*A. arguta*)
Calceolaria
Clover, Hop (*Trifolium agrarium*)
Coriander (*Coriandrum sativum*)
Gardenia (*G. jasminoides*)
Hardhack (*Spiraea tomentosa*)
Indian pipe (*Monotropa uniflora*) (Turns black, of course.)
Johnny-jump-up (*Viola tricolor*)
Ladies'-slipper, yellow (*Cypripedium pubescens*) and pink (*C. acaule*)
Lungwort (*Pulmonaria*)
Marjoram (*Origanum vulgare*)
Mushrooms (*Agaricus, Boletus,* and *Hypholoma*)
Plaintain-lily, blue (*Hosta caerulea*)
Queen-of-the-Meadow (*Filipendula Ulmaria*)
Skunk-cabbage (*Symplocos foetidus*)
Sumac, Staghorn (*Rhus typhina*)
Thistle leaves (*Cirsium lanceolatum*)
Yellow-root (*Xanthorhiza simplicissima*) (Flowers get very dark.)
Viburnum tomentosum
Cabbage butterfly
Rose bug

Fair

Rose of Sharon (*Hibiscus syriacus*)
Anchusa myosotidiflora (*Brunnera macrophylla*)

Anemone japonica
Apple blossoms (*Malus*)
Belladonna (*Atropa Belladonna*)
Bleeding heart (*Dicentra spectabilis* and *D. eximia*)
Calla (*Zantedeschia aethiopica*)
Carnation (*Dianthus Caryophyllus*)
Catmint (*Nepeta Mussini*)
Christmas rose (*Helleborus niger*)
Cornelian cherry (*Cornus mas*)
Clover, white buds (*Trifolium repens*)
Dahlia, button type
Datura (*D. Metel* or *meteloides*)
Daylily, Lemon (*Hemerocallis flava*)
Dead-nettle (*Lamium maculatum* and *L. album*)
Dogwood, Flowering (*Cornus florida*)
Forget-me-not (*Myosotis sylvatica*)
Forsythia (*F. suspensa*)
Gladiolus, light colored
Goutweed (*Aegopodium Podagraria*)
Hyacinth (*Hyacinthus* vars.)
Jack-in-the-pulpit (*Arisaema triphyllum*)
Lamb's-ear leaves (*Stachys lanata*)
Leadwort (*Ceratostigma plumbaginoides*)
Canada lily (*Lilium canadense*)
Marica (*M. Northiana*)
Marigold, French (*Tagetes pumila*)
Milkweed (*Asclepias syriaca*)
Narcissus (*Polyanthus* varieties are better than the others.)
Pansies (*Viola tricolor*)
Plantain-lilies (*Hosta* vars.)
Rosa Mundi (*Rosa gallica* var.)
Squill, Spanish (*Scilla hispanica*)
Snowdrop (*Galanthus nivalis*)
Bird-of-Paradise flower (*Strelitzia Reginae*)
Tansy (*Tanacetum vulgare*)
Trillium (*T. grandiflorum*)
Trumpet-vine (*Bignonia capreolata*)
Violet (*Viola odorata*)
Zinnia (*Z. elegans*)

Poor

Azalea (*Rhododendron Schlippenbachii*)
Bergamot (*Monarda fistulosa*)
Begonia (*B. tuberhybrida* var.) (Red all turned sand color.)
Calendula (*C. officinalis*)
Chrysanthemums (Fall apart)
Coleus leaves (*C. Blumei*)
Cosmos (*C. bipinnatus*)
Crown Imperial (*Fritillaria imperialis*)
Daphne cneorum
Iris (*I. germanica* vars. and *I. xiphioides* "Wedgwood")
Lilies (*Lilium sp.*) (Fall apart)
Daylily, Tawny (*Hemerocallis fulva*)
Lotus, American (*Nelumbium pentapetalum*) (Flowers)
Mullein flowers (*Verbascum Thapsus*)
Flowering tobacco (*Nicotiana alata*)
Sweet Peas (*Lathyrus odoratus*)
Rhododendron (*R. catawbiense* var.)
Roses (yellow and pink ones from the florist) (Too thick.)
Stonecrop (*Sedum spectabile*)
Sunflowers (*Helianthus annuus*) (Fall apart.)
Tulip (*Tulipa* vars.)
Turtlehead (*Chelone glabra*)

SOURCES OF ILLUSTRATIONS OF WEST AFRICAN PLANTS

The drawings which accompany the two installments of Dr. F. R. Irvine's article on the "Indigenous Food Plants of West African Peoples," the second of which commences on the following page, have been obtained from the sources listed below.

Cyperaceae, Jacob Sturm: *Cyperus esculentus* (p. 264). Flora of West Tropical Africa, John Hutchinson & J. M. Dalziel: *Blighia sapida* (p. 230), *Vitex Cienkowskii* (p. 230), *Diospyros mespiliformis* (p. 233), *Solanum incanum* (p. 234), *Dioscorea bulbifera* (p. 258). Flore d'Oware et de Benin en Afrique, Palisot de Beauvois: *Landolphia owariensis* (p. 266). Flowering Plants of Africa, Franz Thonner: *Dioscorea dumetorum* (p. 258), *Piper guineense* (p. 264). Flowering Plants of Northern and Central Sudan, Grace M. Crowfoot: *Balanites aegyptiaca* (p. 232), *Carissa edulis* (p. 264). Die Kulturgewächse der Deutschen Kolonien und ihre Erzeugnisse, R. Sadebeck: *Polygala butyracea* (p. 257), *Treculia africana* (p. 266). Das Pflanzenreich, Adolf Engler: *Cucumeropsis edulis* (p. 255). Annales des Sciences Naturelles, Paris, 1847: *Treculia africana* seed (p. 266). Hooker's Icones Plantarum, 1916: *Digitaria exilis* and *D. Iburua* (both photographed by G. Atkinson) (p. 263). Kew Bulletin of Miscellaneous Information, 1912: *Kerstingiella geocarpa* (p. 257). Collection of drawings at Royal Botanic Gardens, Kew: *Telfairia occidentalis* (p. 255). Herbarium at Royal Botanic Gardens, Kew: *Sorghum margaritiferum, Sorghum caudatum, Oryza glaberrima, Pennisetum nigritarum* (p. 260).

The Indigenous Food Plants Of West African Peoples

By F. R. Irvine

II

CONTINUING the article begun in last month's Journal, in which the vegetation of Tropical West Africa and the agricultural practices of the people furnished a background for a discussion of the local foods that have come from the wild, Dr. Irvine, who lived for many years in the Gold Coast, here concludes his descriptions of the indigenous edible plants of the region. Last month he wrote about the fruits and seeds that are used in cookery. Here he takes up the vegetables of various kinds, cereals, sweetmeats, and finally beverages, including coffee, which is far more appreciated on other continents than in its native Africa.

The sources of the drawings are listed on the preceding page.

Vegetables

Fruits, seeds, roots, and leaves are among the parts of plants that can be classed as vegetables. In a region where foodstuffs of animal origin are sometimes deficient, the indigenous plants are likely to play an important part in the diet. The West African peoples, therefore, resort to a large number of native vegetables for sustenance.

Cooked Fruits and the Like. Seven members of the Pumpkin family (Cucurbitaceae) are native to West Africa. The bottle gourd (*Lagenaria vulgaris*), for example, is almost certainly of African origin. Although it is generally cultivated only for its bottle-shaped gourds and calabashes, the fruits being generally too bitter to eat except when very young, certain improved varieties, especially the tubercled form, may be as good as the pumpkin. The young shoots and leaves are also used as a vegetable, and from the seeds of some forms an oil is obtained which is used in African cookery.

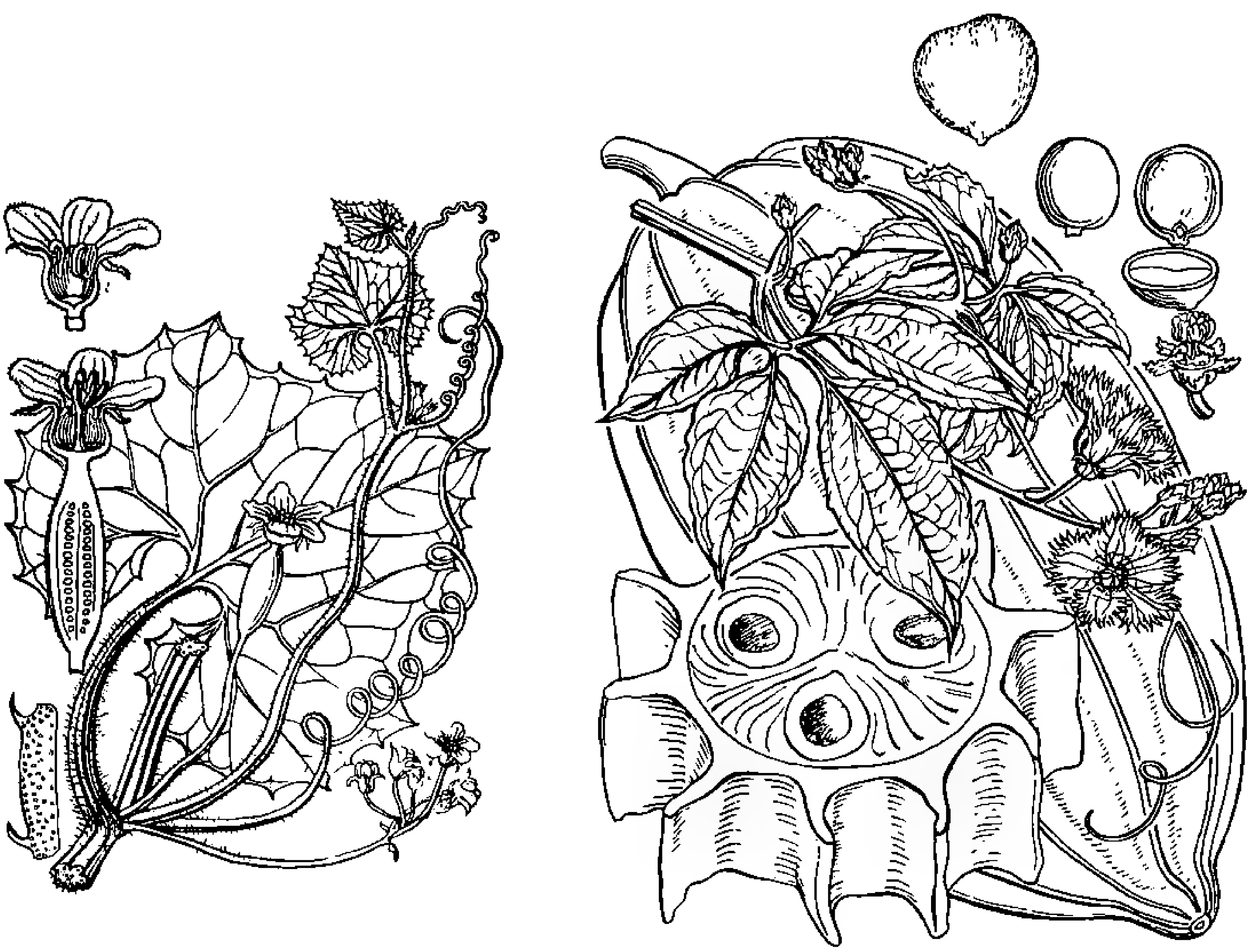
The watermelon (*Citrullus vulgaris*) is also of African origin, and has been traced back to the fourth Egyptian dynasty. Some varieties are bitter, but others are comparatively sweet and may be eaten either raw or cooked in soup. The seeds, known as EGUSI, are dried in the sun, the husks are removed and the kernels are then roasted and ground and put into soup or used as an ingredient in a sauce. They are of good food value (roughly 45% fat and 34% protein), and the oil in them is suitable for cooking. Sometimes the kernels are fermented by the Yorubas of Nigeria to form a food or flavoring called OGIRI. Another food is made from roasted and pounded seeds, which are then wrapped in a leaf and boiled. Sometimes they are fried in oil, with red pepper (*Capsicum*) added.

Watermelons can grow on quite poor soils and with little rainfall. In tropical South African deserts, such as the Kalahari desert, they provide a food and source of water for primitive tribes. They are also eaten by the antelopes in such regions.

Cucumeropsis edulis and *C. Mannii* are cultivated chiefly for their white oily seeds, which are parched and eaten or, like those of the watermelon, pounded and added to food.

The common melon, (*Cucumis Melo*), though of uncertain origin, is probably spontaneous from West Africa to India without interruption. Several varieties are cultivated, some of which are cooked and eaten before ripening, whereas of others only the seeds are eaten.

The fluted pumpkin (*Telfairia occidentalis*) is a native of West Tropical Africa, where, in the opinion of Dalziel, it probably owes some of its extension, such as at the edge of forests, to its persistence after previous



CUCURBITS CULTIVATED FOR THEIR SEEDS

The white oily seeds of *Cucumeropsis edulis* (left) are parched or pounded, to be eaten as nuts or combined with other foods.

The fluted pumpkin *Telfairia occidentalis* (right) has seeds (shown above at the right) with an almond-like flavor when cooked. The seeds of *T. pedata* (one of which is shown at the top) are also edible, after being roasted.

cultivation. The fruits, which are often very large and covered with a waxy bloom, contain a number of large seeds. The cotyledons, which have a pleasant almond-like flavor, are the edible portion, being put into soup or cooked and eaten like beans. The seeds contain an oil used in African cookery, and the young shoots and leaves are used as a pot-herb. A related species, *T. pedata*, has similar properties, and its seeds are roasted and eaten in Gabon, the seedcoats being removed and the kernels pounded into a paste, mixed with fish, and then cooked in a banana leaf. This plant is apparently better known in East Africa and the Mascarene Islands than in its original West African home.*

Polygala butyracea is probably a relic of ancient native culture, and is grown, on a small scale, in the Benue region in Nigeria and also in a few localities in French and Portuguese Guinea. The solid fat obtained from the seeds is used by some tribes in cooking, but in parts of French Guinea and in Adamawa the seeds are parched, ground up, and added to soup. The method of preparation resembles that used for making groundnut paste (peanut butter), except that it is more dry and powdery. It has a pleasant nutty flavour and is made up into balls with meat and other foods and cooked with palm oil and spices. The plants can be grown on poor soils and may be a useful addition to local food supplies.

Two species of *Hibiscus*, OKRO — or okra — (*H. esculentus*) and sorrel (*H. Sabdariffa*), are grown. Okra is believed by De Candolle to be of undoubted African origin. Marcgraf, who saw it in Brazil, quotes its Congo and Angola name, QUILLOBO, which was corrupted by the Portuguese to QUINGOMBO — hence the name "gumbo" given to the plant in the United States. The plant was cultivated by the Egyptians long before the discovery of America, and Schweinfurth saw it growing wild in the Anglo-Egyptian Sudan and in Abyssinia. It is now widely grown in the tropics. Several varieties occur in West Africa, where the fresh, dried, and sliced or powdered fruits are used as a soup vegetable, and the leaves as a pot-herb. Sorrel (*H. Sabdariffa*), known in Sierra Leone as SOUR-SOUR because of its acid flavour, is a native of either tropical Africa or America, but probably the former. Today it is grown throughout the tropics. After the flower has faded, the fleshy red, yellow, or green calyx and epicalyx, which contain malic acid, are used in soup, either in a fresh or a dried state. These parts are likewise used as a sauce or relish, or made into a beverage, after adding sugar and flavourings such as ginger and Guinea grains. Europeans have used the calyx for making jelly, chutney, jam, syrup, and wine. The seeds also are edible, being pounded into a meal and used either as an oily soup or roasted and made into a sauce. They are

*At the time of the World's Fair in New York in 1939-40, seeds of *Telfairia pedata* were imported and sold in one or more markets. The drawing of one which appears at the top of the illustration of *T. occidentalis* on page 255, was made from a single seed (minus the seed-coat) brought to the New York Botanical Garden for identification.—*C. H. W.*

sometimes parched, pounded, and the oil extracted, the residue being put into soup or made into cakes with beans and other foodstuffs. The seeds are further made into fermented cakes, much the same as the widely used DAUDAWA (*Parkia filicoidea*) described above*, in those regions where the locust-bean is scarce. The leaves of the sorrel are also edible.

Several species of *Solanum* are cultivated, *S. macrocarpon* near houses, especially in forest country. Its yellow, somewhat bitter fruits are edible when cooked, and its leaves are used in soups and sauces. Though the garden egg, or BRINJAL (*Solanum incanum*), a sort of eggplant, is

WEST AFRICAN FORMS OF PEANUT BUTTER

An African relative of our popular peanut is the "geocarpa" groundnut, *Kerstingiella geocarpa* (right.) Another West African legume which buries its seedpods in a similar manner is *Voandzeia subterranea,* the Bambara groundnut, sometimes called the Madagascan groundnut.

One of the oldest plants in cultivation on the coast of West Africa is *Polygala butyracea* (left). The seeds of these plants are ground into a paste closely resembling peanut butter.

*See page 234 in the October Journal.

a native of southeast Asia, it has probably been grown in West Africa for centuries, for it has numerous vernacular names there. The bitter fruits of two other species, *S. aethiopicum* and *S. duplosinuatum*, are similarly cooked and eaten.

Chevalier states that *Sesbania pachycarpa* is sometimes grown around villages in upper French Guinea for the sake of the seeds, from which a fermented extract is prepared as a substitute for those of *Parkia* described above. The seeds of *S. punctata* can be used in the same way.

The bush butter tree (*Pachylobus edulis*) is specially grown from seeds and cuttings for the sake of its fruits, the outer portion of which is eaten, either roasted or boiled. It can be used as a dessert fruit or eaten with curries.

A Labiate, *Hyptis spicigera*, is sometimes cultivated like *Sesamum*, its blackish seeds rich in oil being used as food in the same way.

The oil from cotton seeds is also used in West African cookery.

Edible Legumes. The fruits of certain annual leguminous plants are used as food and several have been introduced into cultivation. West Africa possesses two groundnuts of its own, both of which are cultivated as field crops there, though they are not well known outside of the region. These are the Bambara groundnut (*Voandzeia subterranea*) and the "geocarpa" groundnut (*Kerstingiella geocarpa*), both of which, like the common groundnut, or peanut (*Arachis*), bury their pods beneath the soil as they ripen.

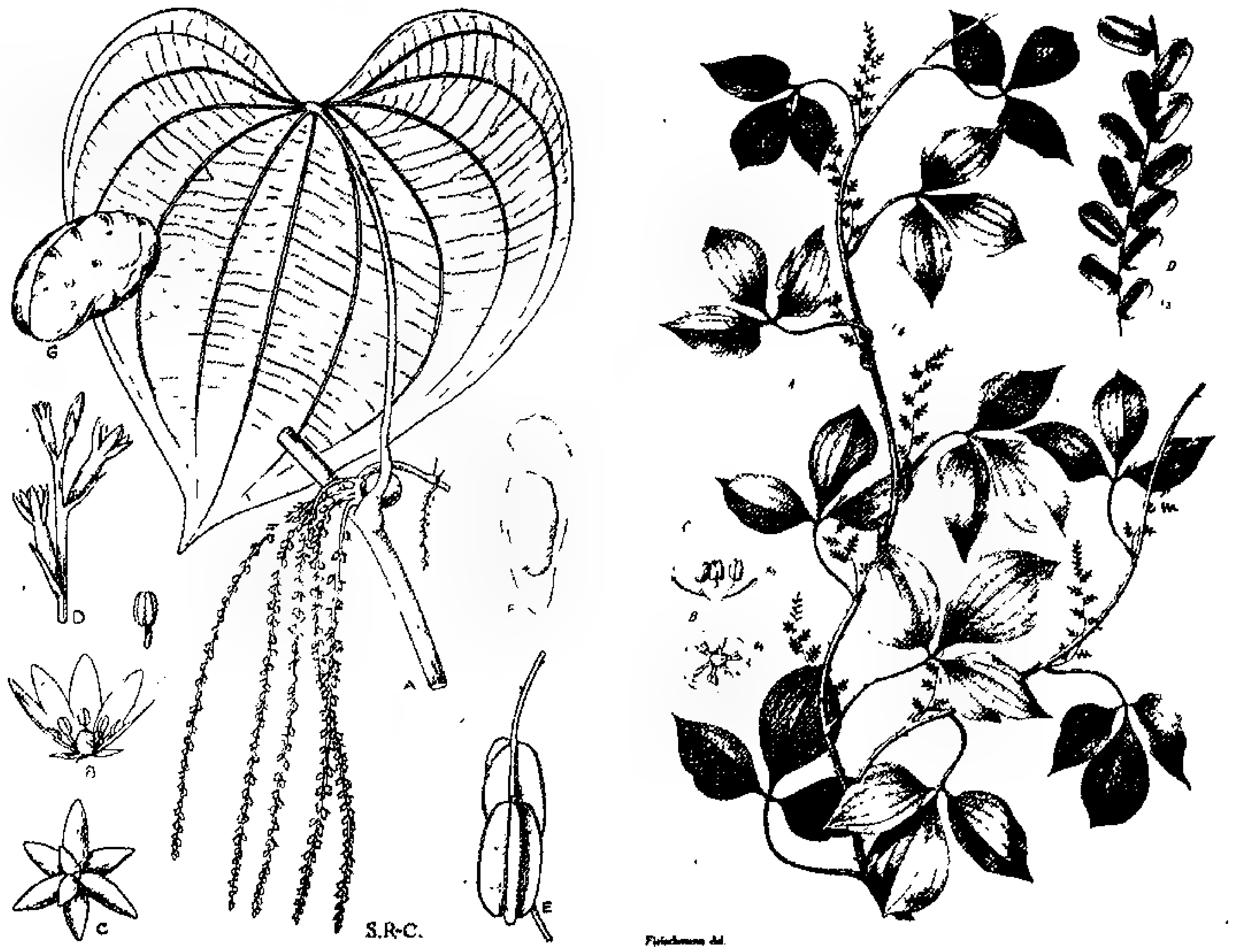
Another West African edible legume is the cowpea (*Vigna unguiculata*), the wild and semi-wild forms of which are almost certainly of tropical African origin.

The various uses of *Parkia* have already been discussed*.

Spinach Plants. Ninety-nine species of West African plants are mentioned by Dalziel as having edible leaves, but it is likely that an even larger number is used as food. Some occur wild, but may be cultivated as well, while a few, such as species of *Solanum* and *Sesamum*, also *Ceratotheca* and *Hibiscus* (okro and sorrel), occur as farm crops. The leaves of two Labiates, the tea-bush (*Ocimum viride*) and *O. americanum* are used in salads, and the latter in soup in northern Nigeria. The leaves of the semi-cultivated hemp-leaved hibiscus (*H. cannabinus*) and the musk-mallow (*H. Abelmoschus*) are eaten in soup or as a pot-herb. A wild lettuce (*Lactuca taraxacifolia*) is sometimes cultivated and the leaves are eaten either fresh or cooked. They are sometimes sold in markets, as balls of cooked or soaked leaves prepared for use in soups or sauces. Three other semi-cultivated plants having edible leaves are *Amaranthus caudatus*, *Gynura cernua*, and *Senecio Biafrae*. Dalziel states that the first was introduced from Asia, but Burkill says it has been used in many parts of Africa

---

*See page 234 in the October Journal.



SOME YAMS, GOOD AND BAD

Cultivated forms of the potato yam or bulbil-bearing yam (*Dioscorea bulbifera*), at the left, have large, liver-shaped, rather flattened aerial tubers, some of which are poisonous, others edible.

The three-leaved yam (*D. dumetorum*) shown at the right is recognized as a poisonous species in its wild form and is sometimes called "bitter yam." Even cultivated forms are generally safe to eat only after the sliced tubers have been soaked for a long time before being boiled.

as a spinach plant, as well as being widely cultivated as a grain crop both in Africa and the Himalayas. According to Dalziel, it is cultivated in West Africa because of its edible seeds, as in India and elsewhere. Its country of origin is uncertain, but it appears to have wider cultivation in Africa than in Asia, where *A. paniculatus* has a greater extension.

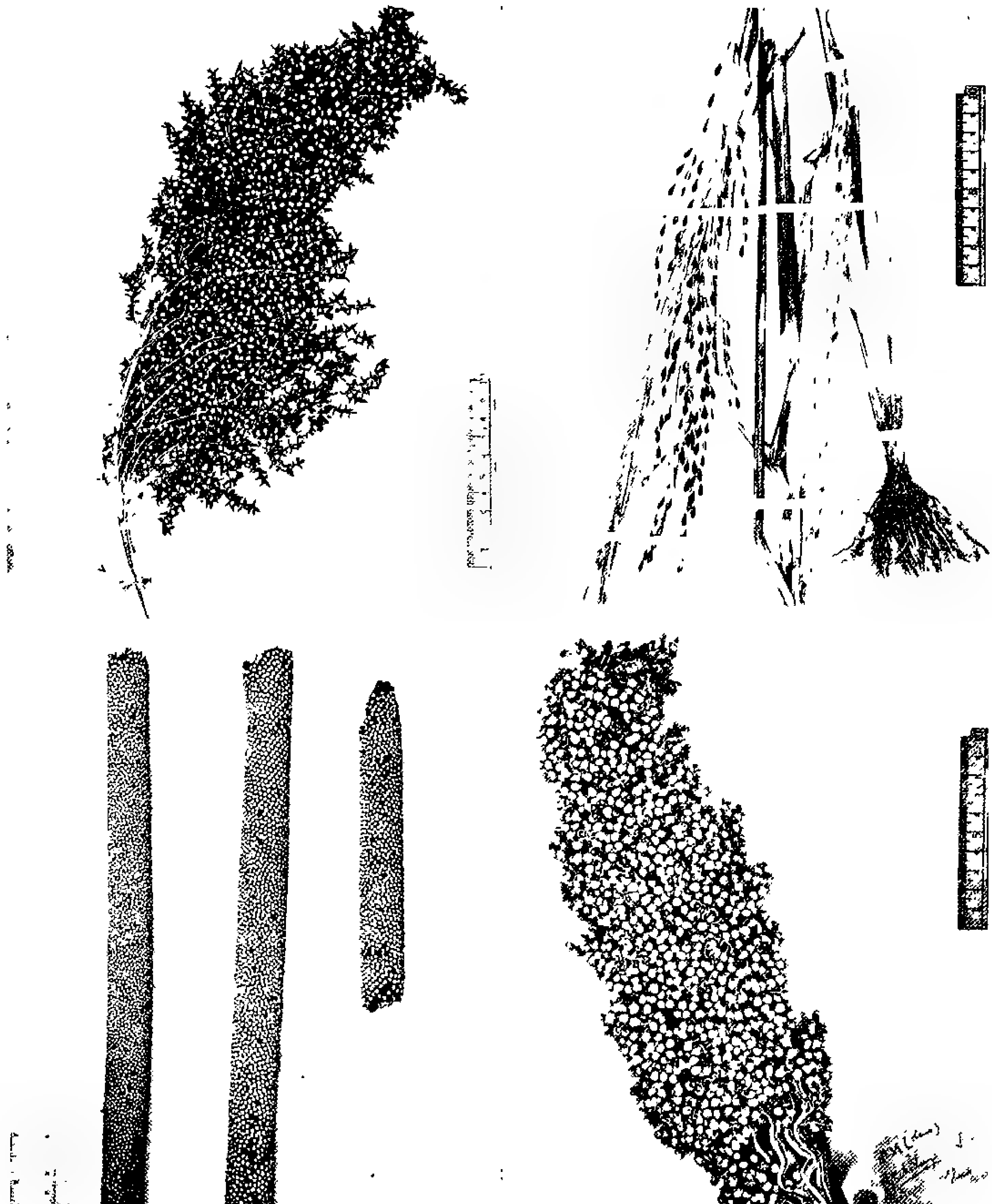
Gynura cernua, a relative of *Senecio* in the Composite family, is sometimes grown as a pot-herb or used for soups and sauces. The leaves of a cultivated form of *Senecio Biafrae*, probably in several varieties, are said to have been used both as a vegetable and as a beverage, being infused and drunk like tea. Though the Indian mustard (*Brassica juncea*) is widely distributed in the tropics, it is believed by Burkill to be of possible African origin. In the East it is cultivated as a condiment and for the oil in its seeds, while the young leaves are used as a vegetable, much like mustard greens in other countries. In West Africa its cultivation for use as a pot-herb and as a peppery-tasting condiment are reported from the Upper Niger and from Sierra Leone.

Root Crops. There are a number of edible species of yam (*Dioscorea*) in West Africa, although certain ones, such as *D. sansibarensis, D. Quartiniana, D. minutiflora, D. smilacifolia,* and certain wild forms of *D. dumetorum* and *D. bulbifera* deserve to be classed merely as famine foods. Most of them tend to be poisonous unless thoroughly soaked and the liquid discarded. While used mainly as a famine food, the wild tubers of *D. Preussii* are still eaten in some districts, especially by hunters, after such preliminary treatment. When cultivated, this species is used for other purposes.

The potato yam or bulbil-bearing yam (*D. bulbifera*) bears aerial bulbils which may reach a diameter of 3 or 4 inches. They are of two main types, one angular, with a thin silvery skin, and the other rounded, with a thicker and corky skin. According to Chevalier, the angular types may be either wild or cultivated. *D. bulbifera* is the most widely distributed of all species of *Dioscorea,* and was introduced into America during the slave trade. The cultivation of this plant in order to develop larger bulbils has resulted in a comparatively small terrestrial tuber being formed. Burkill believes that Africans are still engaged in the process of "ennobling" (cultivating) this species. Its wild forms are generally smaller and much more toxic, de Wildeman reporting in 1938 that in one case the eating of the bulbils resulted in the death of 32 soldiers! Toxic forms like this and other poisonous species, such as the three-leaved yam (*D. dumetorum*), are sometimes specially planted along the edges of farms to discourage thieves!

Although wild forms of *D. dumetorum* are known to be poisonous, and are even used medicinally or as an arrow poison, cultivated varieties have often been sufficiently improved to be edible. These have lobed or star-shaped tubers, varying from white to yellow. They are easy to grow, yield heavily, and are also easy to harvest. The poison is removed by peeling, slicing, pulping and soaking, preferably in running water, otherwise in salt water. A coarse starchy meal is sometimes obtained from this yam. The tuber of the cultivated form is mucilaginous, and, after soaking and cooking, is generally eaten sliced.

Other starchy root crops used in Africa today have been introduced — such as coco-yam (*Colocasia*), which was taken there by the Arabs, and cassava (*Manihot*) and sweet potato (*Ipomoea*), which were brought by the Portuguese. But the Guinea yam (*D. cayenensis*) was, according to Burkill, a crop plant entirely developed by the African himself. Almost certainly, it was originally grown in Guinea (hence its name), and its cultivation is most dense there today. Two main races occur, one of which, the yellow yam, is sometimes called the "twelve months' yam";



CEREALS AS STAPLE FOODS

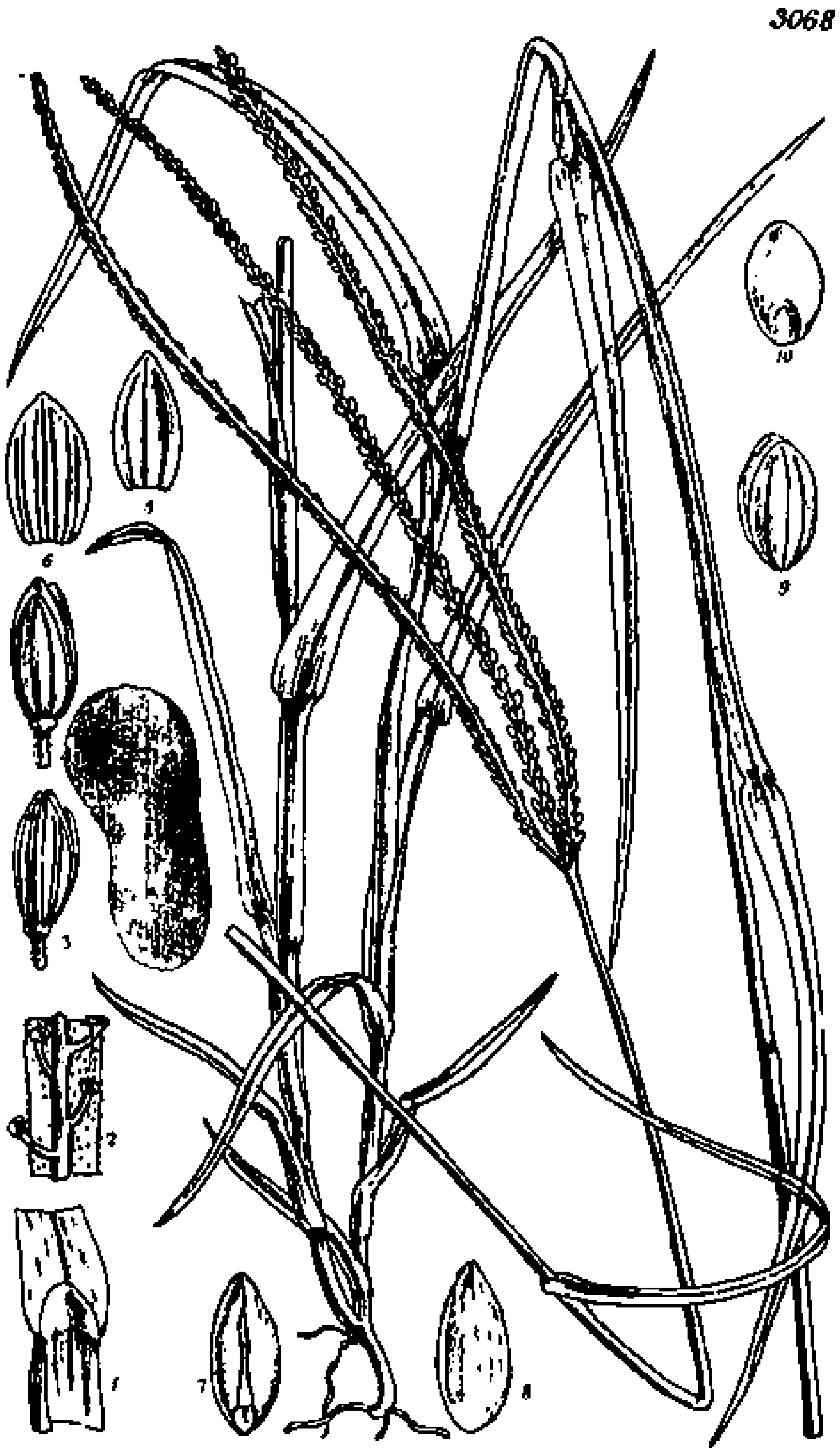
Two of West Africa's numerous species of *Sorghum* are shown here, *S. margaritiferum* (upper left) and *S. caudatum* (lower right). The indigenous rice (*Oryza glaberrima*), shown at the upper right, is one of the three West African species of rice. The spikes of *Pennisetum nigritarum* (lower left) are said to become 4½ ft. long. Their tiny seeds form an important grain crop known in the Hausa dialect of northern Nigeria as "gero."

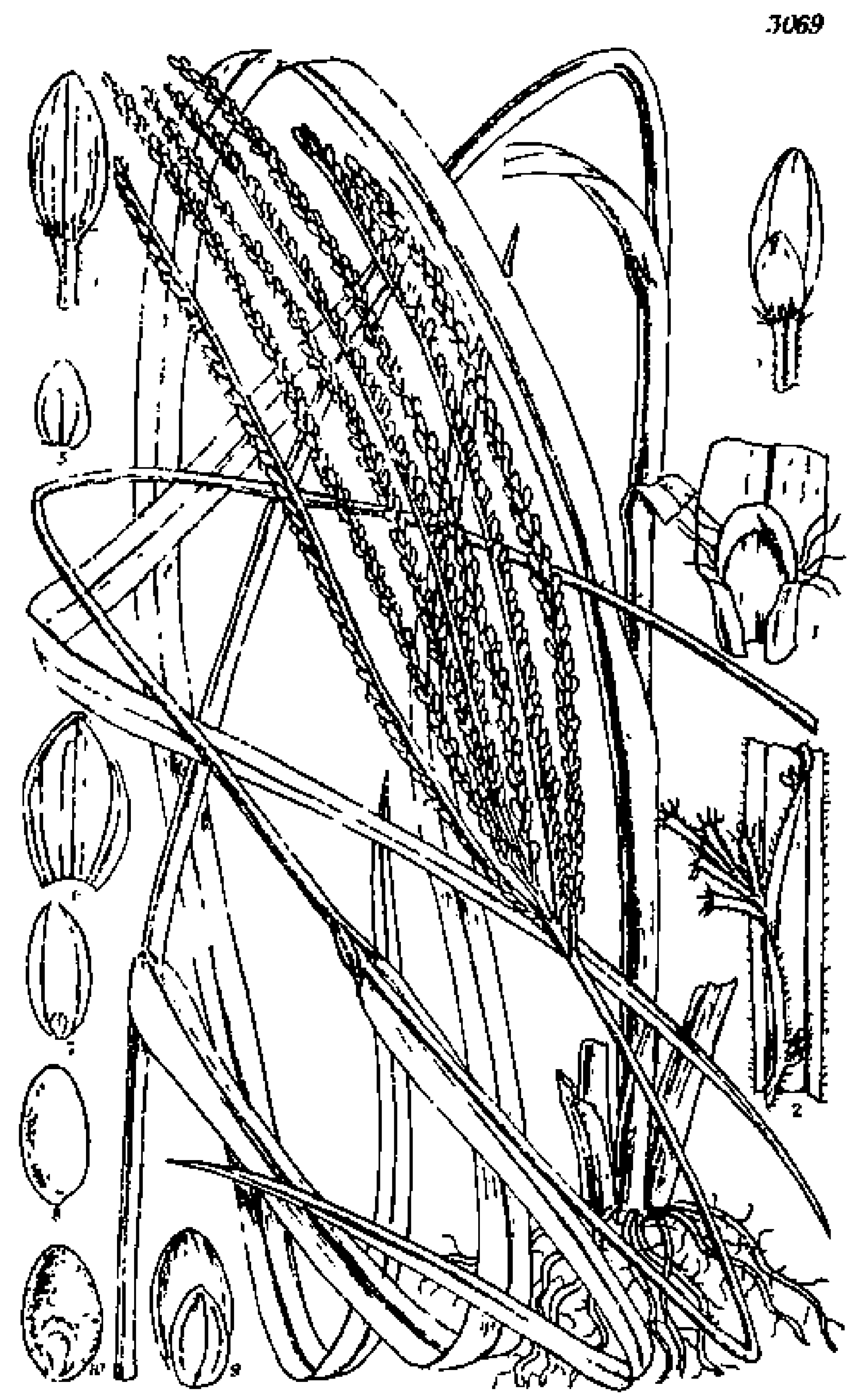
the other, the white yam, has a growing season of about eight months. The long period of growth of the yellow yam restricts it to the moister regions. The main tuber is sometimes cut away, after which the top will produce one or more smaller tubers, giving this race (an inferior one) the West Indian name of "cut-and-come-again." The shorter-seasoned white yam race is grown in the drier regions, for example, to the north of the closed forest, and is, therefore, much more widely grown in tropical Africa. Its tubers keep better than those of the yellow yam. Yams of both races were taken to America in the days of the slave trade. Both produce tubers close under the surface of the ground.

The water yam (*D. alata*), now widely grown in West Africa, where it has many varieties, is, in Burkill's opinion, originally Asiatic. Because it carried well, with little sprouting, it was taken to East Africa and Madagascar and thus was spread, probably by the Portuguese, to other parts of the African coast-line, and eventually to the New World in slave ships.

The genus *Coleus* contains several African species, two of them West African in origin, which produce edible tubers. The Hausa or Sudan potato (*C. dysentericus*), sometimes known as the Madagascar potato (of French colonists), is widely grown in drier parts of tropical Africa and elsewhere, and is believed by Heckel to be of Abyssinian origin. It is cultivated for its edible tubers in Western Sudan, Ubangi-Shari, and the Congo Basin, and is grown preferably on mounds or broad ridges, by the Hausas of northern Nigeria. Numerous small tubers are produced, some reddish-grey or reddish-yellow, others blackish-brown, and others greyish-white. It is propagated by softwood cuttings and by tubers, which take five to six months to mature. According to Barter, they are used in cases of dysentery by the Yorubas, for dietetic rather than medicinal reasons. In hot climates, they are regarded as a most suitable substitute for potatoes. The plant is sometimes grown under irrigation in the dry season, in the same way as onions, wheat, and other crops.

Coleus dazo also has tuberous roots, and its woody stems may be two or more feet in height. Although it occurs wild as well as cultivated in both West and Central Africa, its exact original locality is unknown. It is grown chiefly in the Zaria province of northern Nigeria, but also on the upper Ivory Coast, in upper Ubangi-Shari (under the name of DAZO), and in the lower Congo. The softly hairy and cylindrical tubers are generally up to 4 inches long and ¾ inch in diameter, in composition similar to the ordinary potato. They are more difficult to propagate than the Hausa potato (*C. dysentericus*), and are generally grown from tubers, which require up to six months to mature after planting, although in equatorial regions tubers can be obtained almost throughout the year. Under proper cultivation it is probably possible to get larger yields from this species than from any other Labiate.





TWO DIGITARIAS IN CULTIVATION

"Hungry rice" is the name of *Digitaria exilis* (left) over most of West Africa. In parts of Northern Nigeria a closely related species, *D. Iburua* (right), is grown instead. The tiny grasslike seeds are eaten as porridge, or parched, ground, and mixed with the meal of other cereals.

There is a wild yam-bean (*Sphenostylis stenocarpa*) in West Africa, but it is possible that its country of origin is Abyssinia. Though occasionally found wild, the plant is generally cultivated, along with yams and beans. It is also grown in French Equatorial Africa, the Congo Basin, and in East Africa. The tuber, in appearance like a small sweet potato, two to three inches long, is starchy and is said to taste like an ordinary potato. The seeds of this bean can also be eaten after preliminary soaking.

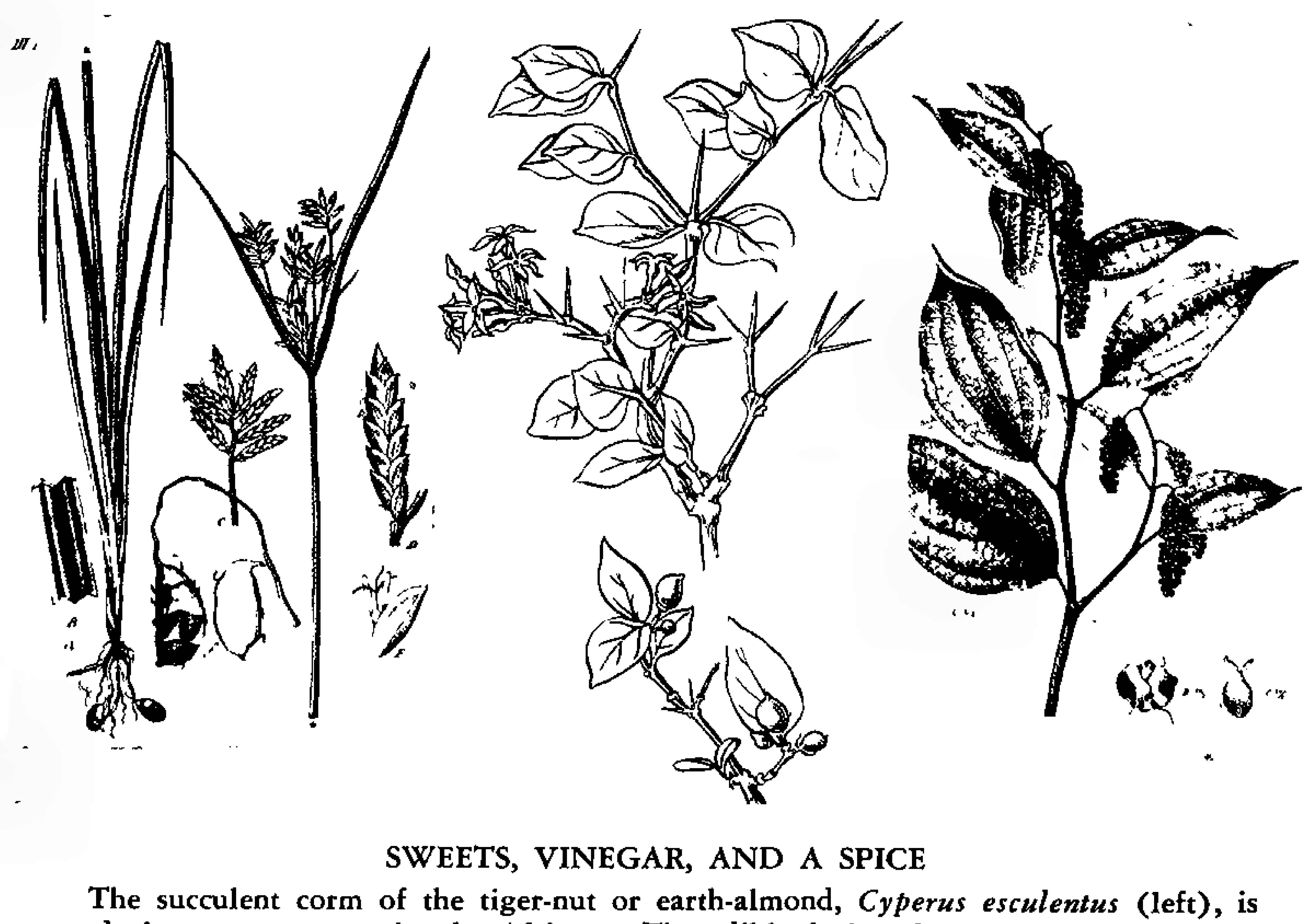
Two kinds of coco-yam are widely grown in West Africa, but both are introductions — *Xanthosoma,* called TANNIA, from America and *Colocasia,* a native of India, which is known as EDDO or DASHEEN in Trinidad and TARO in Polynesia. Its common name of KOKO in West African vernaculars is originally derived from a Creole imitation of its Portuguese name, CURCAS.

Cereals

Among the most important indigenous food plants of West Africa are the cereals, particularly Guinea corn and bulrush millet. Twelve species of Guinea corn or grain sorghums are grown in the dry northern areas. Similarly, eight local species of bulrush millet (*Pennisetum*) are in cultivation, being generally grown in still drier regions than those used for growing *Sorghum*. Both cereals feature largely in local life, especially in the drier regions of western Sudan and northern Nigeria. An indigenous finger millet (*Eleusine corocana*) is cultivated in northern Nigeria both as food and for malt. Two species of *Digitaria* are sometimes cultivated — hungry rice (*D. exilis*) in northern parts of Nigeria, Togo, and Sierra Leone, and in Portuguese Guinea and Gambia, while around Zaria and Zinder in Northern Nigeria a closely related species, *Digitaria Iburua*, is cultivated.

There is one cultivated West African variety of barley, *Hordeum vulgare* var. *hexastichon*, while two local species of rice, *Oryza glaberrima* and *O. Stapfii*, are grown; *O. glaberrima* being cultivated inland from French Sudan to Northern Nigeria, and *O. Stapfii* in Gambia, where it is regarded as the original rice, as it is hardier than any other form.

Two varieties of wheat are native to West Africa, an awnless soft wheat, *Triticum vulgare* var. *leucospermum*, being grown in parts of



SWEETS, VINEGAR, AND A SPICE

The succulent corm of the tiger-nut or earth-almond, *Cyperus esculentus* (left), is made into a sweetmeat by the Africans. The edible fruits of *Carissa edulis* (center) are sometimes fermented to form vinegar. The West African black pepper, *Piper guineense* (right), is used in seasoning food and in West African herbal medicine.

northern Nigeria as a wet season crop or under irrigation in the dry season, mainly by the well-to-do, while a macaroni wheat, *T. durum* var. *leucurum*, is commonly cultivated in northern Nigeria. Both are used as food, either made into wheaten cakes, boiled in oil and seasoned, or into buns, or finely ground with butter or even made into a form of macaroni called TALIYA by the Hausas.

Seasonings, Spices, and Vinegars

Certain plants are used as condiments, digesters, and relishes. The hoary or "American" basil (*Ocimum americanum*), occurs wild in Africa and Asia, and is not American at all, except by introduction. Its leaves are used as a stuffing for fowl, or may be boiled with meat or in soup. *Solanum anomalum* is sometimes cultivated and its red berries used in soups and sauces as a condiment, being said to restore the appetite of sick persons. They are often dried and preserved and are sometimes mixed with DAUDAWA (*Parkia*).

Solanum nodiflorum may occur wild, or is sometimes cultivated, its small black berries being quite bitter, when wild, and used as a digestive tonic and appetizer for sick persons. When cultivated, the fruits are sometimes very sweet, and can be eaten either raw or cooked, alone or mixed with other food.

The Umbelliferous plant, *Ammodaucus leucotrichus,* is grown in the upper Niger valley, Mauritania, and in Sahara oases for the use of its seeds in sauces as a condiment. The widespread use of Guinea grains or grains of paradise (*Aframomum Melegueta*) as a spice in food has already been mentioned**. The kernels of *Irvingia gabonensis* are used as a seasoner in various African foods, and the Labiates *Aeolanthus heliotropioides* and *A. pubescens* are cultivated for use as a flavouring in soups.

Vinegar is obtained after fermenting the fruits of *Carissa edulis,* and can also be made from the sap of the fan palm, *Borassus.* From the fruits of a wild grape (*Cissus caesia*), an acid drink or vinegar is obtained in Sierra Leone.

Sweetmeats

In Africa, sweetmeats are probably much less common than in other regions — India, for example. West African peoples, however, do make sweets from extracts of fruit pulps of certain trees, such as the tallow tree (*Detarium senegalense*), West African ebony (*Diospyros mespiliformis*), *Cordia abyssinica,* and *Vitex grandifolia,* honey being added in some cases. Although sugar-cane is grown, it is not a native, and the canes are generally only chewed. Molasses is made, however, from the stems of sweet sorghum (*Sorghum mellitum*), which is also used in making sweetmeats called ALEWA in Hausa, a word of Asiatic origin.

**See pages 229 and 231 in the October Journal.

BEVERAGES IN THE LAND OF COFFEE

In some of the regions where it originated, coffee itself is little appreciated. While it is used to some extent in West Africa today, it is by no means an important drink there. One of the local species, Sierra Leone or Upland coffee, *Coffea stenophylla*, is shown at the left.

A sort of almond milk is prepared from the ground-up seeds of the African breadfruit (*Treculia africana*), center. The fruiting head, shown directly above, contains a great many brownish seeds buried in a spongy pulp. It measures up to 18 inches in diameter, and is up to 30 pounds in weight.

Fruits of the vine rubber (*Landolphia owariensis*), right, are made into a fermented drink.

The Hausas make at least three different kinds of sweetmeats, one of which is commonly prepared from tubers of the tiger-nut (*Cyperus esculentus*) — elsewhere known as earth-almond or rush-nut. In certain parts of West Africa the pap made from cereals is sweetened with the fruits of *Cordia*.

Beverages of Many Kinds

Unfermented Drinks. From the ground-up seeds of the African breadfruit (*Treculia africana*), a kind of "almond milk" is prepared, while from the fruits of the semi-cultivated hog-plum (*Spondias Mombin*) a refreshing drink can be made. The powdery edible pulp from the fruits of two or three leguminous trees, such as the velvet tamarind (*Dialium guineense*) and *Parkia biglobosa,* is macerated in water to make other unfermented beverages. When this *Parkia* is used, honey is sometimes added to make a soothing drink for children. If the West African locust-bean (*Parkia filicoidea*) is used, the drink prepared is sometimes mixed with tamarind water (from *Tamarindus*). The seeds themselves of *P filicoidea* provide another kind of unfermented drink when ground to a fine meal and mixed with water to make a thin gruel. An attractive beverage is prepared from the macerated fruits of the jujube tree (*Zizyphus Jujuba*), and a pleasant drink known as KANGO in Hausa is prepared from the pulp of the desert date (*Balanites aegyptiaca*).

Fermented Drinks. Palms are the source of most of the fermented beverages, chiefly the oil palm (*Elaeis*), the *Raphia* palms, the fan palm (*Borassus*), and even the small wild date palm (*Phoenix reclinata*). The trees are often tapped as they stand, but on the Gold Coast in particular the oil palm is first cut down, then an incision is made in the trunk, and the wine is collected daily. It resembles ginger beer at first, but becomes increasingly intoxicating later. In parts of West Africa, palm wine is used instead of commercial yeast in bread-making.

The fruits of several dicotyledonous trees are also used in the preparation of fermented beverages, examples being the black plum (*Vitex Cienkowskii*), *V. grandifolia,* West African ebony (*Diospyros mespiliformis*), *Lannea acida,* desert date (*Balanites aegyptiaca*) and two "vine rubbers," (woody climbers) in the genus *Landolphia.* The seeds of cultivated indigenous cereals, such as Guinea corn (*Sorghum*), bulrush millet (*Pennisetum*), and others are frequently made into fermented drinks.

Coffees. The species of *Coffea* present a curious situation, as about ten kinds of commercially useful coffees are native to tropical Africa, some still occurring in the wild state. Of these, five species are native to West Africa — namely, Lagos or Abeokuta coffee (*Coffee Abeokutae*), Liberian coffee (*C. liberica*), Robusta or Rio Nuñez coffee (*C. robusta*), Sierra Leone, Upland, or Stenophylla coffee (*C. stenophylla*), and *C. Maclaudii.* Stenophylla was, according to Dalziel, cultivated in a small way long ago in both French Guinea and Sierra Leone, and was probably grown in French Guinea in early days by the Portuguese. According to Afzelius, Liberian coffee was being cultivated in Sierra Leone in 1792, and has been grown along the West African coastline during the last century. Several other species of *Coffea* of more or less economic interest grow in West Africa. There seems little evidence, however, of the use of coffee as a beverage by West Africans in pre-Portuguese days. The chief coffee plant of the world, and the source of "Brazilian" coffee — that is, Arabian coffee (*C. arabica*) — is a native of the Abyssinian mountains. According to De Candolle, the use of coffee was very ancient in Abyssinia, and the berries were probably collected from wild plants for centuries before the plant was cultivated. Its use spread later to Egypt, Persia, and Arabia, and so to other parts of the world.

NOTICES AND REVIEWS OF RECENT BOOKS

Attention, People!

OUR PLUNDERED PLANET. Fairfield Osborne. 217 pages, bibliography, reading list. Little, Brown & Co., Boston, 1948. $2.50.

We have upset the balance of living things in nature by not recognizing our true biological position in the scheme of things on earth. Instead of striving toward a balanced natural relationship with other living things, we put ourselves above this and seem to see no wrong in plundering our earth of all her natural resources.

It has been destruction, although we look upon it as justified exploitation. Little thought has been given to the fact that the sources are not infinite, that without careful planning and restorative measures they will eventually disappear; and we will have brought about our own destruction.

Osborne explains the problem well and shows clearly what has already occurred as a result of our lack of understanding, and what is happening right now. Many areas of the world we now know as desert lands were at one time fertile, forested lands, sites of high civilizations. So it may come to be within our own country as well as elsewhere in the world, he warns. We have only to recall the Dust Bowl area as evidence.

He wishes to awaken the public consciousness to the ever growing problem of the conservation of our natural resources. If widely read, his book, written in popular form, should do much in this direction.

ELIZABETH PIECZUR.
University of Michigan.

New Edition of Dodge & Rickett On Practical Plant Pathology

DISEASES AND PESTS OF ORNAMENTAL PLANTS. Bernard O. Dodge and Harold W. Rickett. 638 pages, illustrated, indexed. The Ronald Press, New York, Revised edition, 1948. $6.

It is both a tribute to the satisfaction with which the first edition of the Dodge-Rickett manual met the need for a reference work on diseases and pests of ornamental plants, and an evidence of the increasing demand of American gardeners for information, that a second edition is now required. In view of the slow advance of scientific knowledge in this field in contrast to the bewildering variety of plants offered for decorative use, and because of the host of new materials recently made available for pest control, no handbook aiming to treat this subject comprehensively can as yet be wholly successful. However, the present volume probably assembles more information about the many different enemies of ornamental plant culture than any other book adapted to American requirements.

The new volume appears somewhat larger than its predecessor but contains the same number of pages and illustrations. It is printed on heavier paper, which has effected a notable improvement in the clarity of the figures.

The authors have made a conservative choice of information that can advisedly be presented on the many new materials offered for pest control. Where decisive advantages have been demonstrated, recommendations are given for the use of the chlorinated hydrocarbons, organic sulfur and phosphorus compounds, azobenzene, and others. Perhaps a little greater emphasis could have been placed on the advantages of the thiocarbamate and commercial fixed-copper fungicides, especially in dust forms, in preference to "standard" 4:4:50 (or the worse 4:6:50) Bordeaux mixture—which is a mess in any garden! The insertion of a list of host plants in the table of contents appreciably facilitates finding the pertinent information in the text.

The errors of statement or composition in the first edition have been largely eliminated. Attention may be drawn to a few that remain, not with captious intent but in the interests of accuracy:

Page 116, a level teaspoon (ca. 5.3 ml.) is approximately 1/6th, not 1/8th, of 1 fluid ounce; p. 135, the section heading should be *Alnus* instead of *Alchemilla*; p. 341, *Helichrysum* should not be spelled *Heliochrysum*; p. 402, Plakidas' "black-scale disease" of Easter lilies is caused by *Colletotrichum lilii,* not *Vermicularia* sp.; p. 403, yellow flat is authentically recorded in commercial lily production in the United States only in Florida; p. 420, the pathogen of the mulberry popcorn disease is *Sclerotinia* (or more accurately *Ciboria*) *carunculoides,* not *Sclerotium c.*; p. 424, *Phymatotrichum* root rot is not known in Alabama, but *Cercospora nandinae* is reported from Alabama and South Carolina; p. 425, dry scale rot of narcissus is associated with a fungus that *resembles* the one causing gladiolus dry rot, but there is no known correspondence of the two diseases; p. 427, six species of aphids are known to act as vectors of narcissus mosaic; p. 537, apparently 50% wettable DDT (not 5%) is intended; p. 612, powdery mildew of zinnias is not merely occasional but nearly universal in occurrence, and alternaria leaf spot of zinnia is widespread and troublesome at times in the United States.

Several omissions of important diseases also may be noted, namely: necrotic fleck (cucumber mosaic + symptomless virus) and bunchy top (*Aphelenchoides olesistus*) of Easter lilies; spotted wilt (virus) of greenhouse-grown callas and nasturtiums (*Tropaeolum*).

Gardeners and plant pathologists alike will find this a very useful compendium of information in a field of diffuse and fragmentary literature.

FREEMAN WEISS,
U. S. Department of Agriculture.

Bright Tobacco — a Factor in The South's Economic Life

THE BRIGHT-TOBACCO INDUSTRY. Nannie May Tilley. 754 pages, illustrated, indexed. University of North Carolina Press. Chapel Hill, 1948. $8.

Miss Tilley, who wrote this book when she was a consultant in history at Duke University and director of the manuscript department of the Duke Library, has had access to an enormous mass of source material, including the famed Arents tobacco library, and from this she has produced a book that is not only interesting and informative, but of genuine historic value.

To the South, tobacco is not merely an agricultural product; in its development it has been inextricably tied in with politics, government, education, social progress, and the race question, as well as being a way of making a living. The author grew up thoroughly familiar with the way of life in the tobacco country. With that background and as a trained historian with special interests in regional and agricultural history, she has admirably assembled the voluminous information at her disposal, and the result is a book that is authentic and authoritative. With rare skill as a writer, she has made her subject live.

Concerned with the cultivation, marketing and manufacture of the bright, flue-cured leaf of the South from 1860 to 1929, the author begins by recording the great excitement among the Virginia and Carolina farmers, speculators and manufacturers over the new type of leaf and its development. Her chapter on marketing, in which she describes the rise of the auction method of sale, is lively and interesting, and her account of the start and growth of the manufacture of tobacco, first plug and smoking tobacco and then cigarettes, is equally informative and equally well told. The book is copiously provided with footnotes identifying her sources of authority, and has forty-five very pertinent illustrations.

The book is invaluable to members of the tobacco industry who desire to be informed on their subject, to copywriters for advertising agencies that have tobacco accounts, and to students of economic history. In addition to that, it makes mighty interesting reading for the plain, ordinary variety of reader. The author is a natural-born story-teller; she had an interesting story to tell, and she has told it well.

P. V. HOYLE,
Editor, The Tobacco Leaf.

Plants of Long Ago

AN INTRODUCTION TO PALEOBOTANY. Chester A. Arnold. 433 pages, illustrations, drawings, charts, index. McGraw-Hill, New York, 1947. $5.50.

Dr. Arnold set out to prepare a textbook of paleobotany and has accomplished his objective. In it he presupposes that the student already is acquainted with plant groups and also has a reasonably good background in plant morphology. For the most part he avoids conclusions on certain of the more controversial subjects of paleobotany; this perhaps is advisable in a general text in a field which is advancing rapidly.

ANCIENT PLANTS AND THE WORLD THEY LIVE IN. Henry N. Andrews, Jr. 279 pages, 166 figures, indexed. Comstock Publishing Co., Ithaca, N. Y., 1947. $4.50.

For the reader with no prior knowledge of botany, but with an interest in fossils, Dr. Andrews has provided an introduction to the plants of the past; it perhaps is to be regretted that he did not find opportunity to tell us a little more of "the world they live in"—this would have served to round out the subject for the general reader.

W. H. CAMP.

For First Acquaintance

BEGINNER'S GUIDE TO WILD FLOWERS. Ethel Hinckley Hausman. 376 pages, illustrated, indexed. G. P. Putnam's Sons, New York, 1948. $3.50.

Here is a book which should appeal especially to the beginner. To one with little knowledge of botany the most tangible characteristic of an unknown flower is apt to be its color. Accordingly, the author has arranged her material in five sections by color. While this may be a less scientific approach than the arrangement according to families which she used in her earlier book, "The Illustrated Encyclopedia Of American Wild Flowers," it facilitates the identification of species by the novice.

The volume is profusely illustrated with line drawings. Each illustration is accompanied by a paragraph of concise information as to the common and scientific name of the species, period of bloom, locality where it usually is found, geographic range, and other characteristics. If a flower blooms in several colors, both illustration and text are repeated under each color classification.

Unlike the author's Encyclopedia, this field book applies particularly to the area east of the Mississippi. Although more than 1,000 flowers are described, it is not surprising to find some species of wide distribution omitted in a guide of this size.

In the interests of wild-flower conservation, the index is keyed to show which flowers should be picked sparingly or not at all.

MARJORIE AND WALTER SHANNON.

Notes, News, and Comment

City's Anniversary. The exhibit of "Plants that Serve Mankind and Where They Originated," which the New York Botanical Garden had at the International Flower Show last March, was repeated at Grand Central Palace during the summer, as part of the Golden Anniversary observance of the City of New York. The exhibit this time was entitled "Geographic Distribution of Plant Products in New York's Markets," and the map, instead of being horizontal, was vertical, with streamers coming in to New York from the distant places where the products shown originated. About 100 important plant products were displayed. The map was on view from Aug. 23 to Sept. 19.

Also in the City's Golden Anniversary exhibit were a score of kodachrome scenes from the Garden in a series on the museums of New York, and pictures of the Garden fifty years ago, today, and in the future.

The Wayside Gardens Co., INC.
REG U S PAT OFF
FLOWER BULBS · ROSES SHRUBS · HARDY PLANTS

51 Mentor Avenue, Mentor, Ohio

J J Grullemans, President

Dear friends:

Spring may seem far away as you put your garden in shape for the winter ahead.

But in a sense, it's already spring here at Wayside Gardens. For right now, our work is on the new plants, roses and shrubs for your spring garden. We've checked our fields and greenhouses. To say that our 1949 introductions look good is putting it mildly.

And we have just finished putting together our 1949 Spring Catalog. We're almost as proud of this book as we are of the lovely new things it illustrates in true-to-life colors. At a glance you'll picture their beauty in your own garden.

It's a practical book, too. Descriptions are clear, cultural instructions complete. This book, almost 200 pages, the finest published in the horticultural industry, will be available about the first of January. To be sure you get your copy, it is necessary that you enclose with your request 50¢, coin or stamps, to cover postage and handling costs.

Very truly yours,

J J Grullemans

J. J. Grullemans, President

Prizes. Flower prints and other materials from the New York Botanical Garden's library were awarded three first prizes at the Flower Show of the Ho-Ho-Kus Garden Club in New Jersey Sept. 18 and 19. The prints were selected and arranged by Mrs. William Ihnefeld.

An educational exhibit of plant products of the New World, inspired by the New York Botanical Garden's exhibit at the International Flower Show last March and arranged by Mrs. J. J. Walsh, won a prize for the Garden Club of Quincy, Mass., at a midsummer show.

Lectures. Dr. P. P. Pirone addressed the 24th Annual Convention of the National Shade Tree Conference at Milwaukee Aug. 26, on *Dothirella* canker, a new disease which is endangering plane trees in New York City. On October 20 he talked before the Torrey Botanical Club on "Some Important Diseases of Shade Trees."

Dr. E. E. Naylor showed the Garden's long film of "Scenes and Activities" Sept. 13 to the Larchmont Garden Club, an Affiliate.

Recent Deaths On the Gardening Staff

John Hartling. After a short illness the latter part of the summer, John Hartling, who had been on the Garden horticultural staff for 41 years, died Sept. 26. Mr. Hartling was best known to those who frequented the Rose Garden, for the greater part of his career had been spent in looking after the Garden's large collection of roses on the east side of the grounds.

Harold J. Wilson. The son of Percy Wilson, Harold J. Wilson, who was in charge of all labeling of plants at the Garden, died by his own hand Aug. 5. He is survived by his mother and his wife. Thirty-eight years old, he had been employed at the Garden continuously since 1929, except for the war years and a short time after, when he was employed outside as a draftsman.

Harry Schaefer. Last June 14 occurred the death of Harry Schaefer, who had been a gardener at the Botanical Garden since 1903. During his early years here he had had charge of all of the pruning work.

Venezuela Expedition

Dr. Bassett Maguire sailed October 15 for Puerto la Cruz, in northern Venezuela, on the first lap of an expedition for plant collecting on Cerro Sipapo. He expects to be away at least four months. Accompanying him is Louis Politi, the Garden's arboretum foreman and chief assistant to the horticulturist.

The trip, to be known as the Kunhardt Sipapo Expedition, is being financed by H. R. Kunhardt, Jr., a member of the Corporation of the New York Botanical Garden, who for some years past has been sending the Garden valuable collections of Venezuelan orchids and other plants.

From Puerto la Cruz, the party was scheduled to go to Santa Barbara camp, the Sinclair field station nearby, to organize the last details of the expedition. From there they were to go to Caracas, then fly to Puerto Ayacucho, on the upper Orinoco, which would take them less than 100 miles from their objective. The rest of the trip was to be made by motor lorry and motor boat to an Indian settlement five miles from the foot of the mountain, where base camp was to be established. A series of intermediate camps were to be set up on the way to the top.

Dr. Maguire's plans were to reach the summit by Nov. 7, which would be at the break of the rainy season, and to remain on top for about two months.

Cerro Sipapo, which rises 7,000 feet above the surrounding terrain, is approximately ten miles long, with a river running through a deep valley down the center and a lake embedded in one of the ridges. Although the mountain has been known to scientists since the beginning of the 19th century, when Alexander von Humboldt first observed it from the Orinoco, it has been scaled only once, so far as records show. This was within the past ten years, when William H. Phelps, Jr., went there on an ornithological expedition.

As the westernmost of the isolated high sandstone massifs of southern Venezuela, Cerro Sipapo has developed a remarkably distinctive and unique flora. The chief objects of the expedition will be to increase the knowledge of the plant life of the area and to bring back as complete and rich a collection as possible of rare and attractive plants for both scientific and horticultural purposes.

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station, use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue bus No. 41 to Bedford Park Boulevard.

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs. Elon Huntington Hooker, First Vice-Chairman; Mrs. Richard de Wolfe Brixey, Second Vice-Chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Guthrie Shaw, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

Arthur M. Anderson
Mrs. Arthur M. Anderson
Mrs. George Arents, Jr.
George Arents, Jr.
E. C. Auchter
Mrs. Elliott Averett
Dr. Raymond F. Bacon
Prof. L. H. Bailey
Stephen Baker
Sherman Baldwin
Charles W. Ballard
William Felton Barrett
Mrs. William Felton Barrett
Howard Bayne
Edwin De T. Bechtel
William B. Bell
Prof. Charles P. Berkey
Prof. Marston T. Bogert
Prof. William J. Bonisteel
Mrs. James Cox Brady
George P. Brett
Mrs. Richard de Wolfe Brixey
Leonard J. Buck
Mrs. Charles Burlingham
Miss Mabel Choate
Miss E. Mabel Clark
W. R. Coe
Mrs. Jerome W. Coombs
Mrs. Henry S. Fenimore Cooper
Mrs. William Redmond Cross
Mrs. C. I. DeBevoise
Mrs. Thomas M. Debevoise
Mrs. Sidney G. de Kay
Edward C. Delafield
Mrs. John Ross Delafield
Julian F. Detmer
Mrs. Charles D. Dickey
Mrs. Charles Doscher
Mrs. Walter Douglas
Mrs. John W. Draper
Henry F. du Pont
Mrs. Moses W. Faitoute
William B. O. Field
Mrs. Robert H. Fife
Mrs. Reginald Fincke
Harry Harkness Flagler
Mrs. Mortimer J. Fox
Childs Frick
Rev. Robert I. Gannon, S.J.
Dr. H. A. Gleason
Mrs. Frederick A. Godley
Charles B. Harding
Mrs. Montgomery Hare
Mrs. William F. Hencken
Mrs. A. Barton Hepburn
Mrs. Elon H. Hooker
Mrs. Clement Houghton
Mrs. Roy A. Hunt
Archer M. Huntington
Mrs. O'Donnell Iselin
Pierre Jay
Mrs. Walter Jennings
Mrs. Alfred G. Kay
Mrs. F. Leonard Kellogg
Mrs. Warren Kinney
Mrs. Lee Krauss
H. R. Kunhardt, Jr.
Mrs. Albert D. Lasker
Mrs. Barent Lefferts
Clarence McK. Lewis
Mrs. William A. Lockwood
Dr. D. T. MacDougal
Mrs. James C. Mackenzie
Mrs. David Ives Mackie
Parker McCollester
Miss Mildred McCormick
Louis E. McFadden
Dr. E. D. Merrill
John L. Merrill
Roswell Miller, Jr.
S. P. Miller
George M. Moffett
H. de la Montagne
Col. Robert H. Montgomery
Mrs. Robert H. Montgomery
Barrington Moore
Mrs. William H. Moore
B. Y. Morrison
Frederick S. Moseley, Jr.
Mrs. Augustus G. Paine
Mrs. James R. Parsons
Rufus L. Patterson
Mrs. Wheeler H. Peckham
Mrs. George W. Perkins
Mrs. Hugh Peters
Howard Phipps
Rutherford Platt
Francis E. Powell, Jr.
Mrs. Harold I. Pratt
Mrs. Rodney Procter
Mrs. Joseph M. Proskauer
Mrs. Henry St. C. Putnam
Mrs. Grafton H. Pyne
Lady Ramsey
Stanley G. Ranger
Johnston L. Redmond
Prof. Marcus M. Rhoades
Mrs. Junius A. Richards
Dr. William J. Robbins
Mrs. Melvin E. Sawin
John M. Schiff
Mrs. Henry F. Schwarz
Mrs. Arthur Hoyt Scott
Mrs. Arthur H. Scribner
Mrs. Townsend Scudder
Mrs. Samuel Seabury
Mrs. Guthrie Shaw
Prof. Edmund W. Sinnott
Mrs. Samuel Sloan
Edgar B. Stern
Chauncey Stillman
Nathan Straus
Mrs. Theron G. Strong
Mrs. Arthur H. Sulzberger
Joseph R. Swan
Mrs. Joseph R. Swan
Mrs. Thomas D. Thacher
Mr. Oakleigh L. Thorne
Prof. Sam F. Trelease
Arthur S. Vernay
Mrs. Antonie P. Voislawsky
Manfred Wahl
Allen Wardwell
Nelson M. Wells
Alain C. White
Mrs. Nelson B. Williams
John C. Wister
Richardson Wright

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

VOL. 49 DECEMBER PAGES

No. 588 1948 273-304

DECEMBER EVENTS AT THE GARDEN

Christmas flowering plants will follow the current display of chrysanthemums in the Conservatory, which is open daily from 10 until 4. In the Museum there will be the annual winter show of the Bronx Artists' Guild, in addition to the permanent main floor exhibits of plants of economic use and their products, mushrooms and wild flowers in life-size models, and historic microscopes.

The Museum exhibits are on view every day from 10 to 5; the Library (top floor) is open to the public for reference work from Monday through Saturday. The Herbarium may be consulted during the week under the direction of a staff member. The Botanical Garden's offices are open Monday through Friday until 5 p.m. each day.

AFTER THE FIRST OF THE YEAR

Looking forward to the early weeks of 1949, the New York Botanical Garden has the programs and courses listed below to offer:

Free Saturday Programs

3 p.m. in the Lecture Hall

Jan. 8 *The Living Earth*
Four short motion picture films

Jan. 15 *Your Garden Soil and What it Needs* — *F. W. Kavanagh*, Associate Curator

Jan. 22 *The Story of Hudson's River* — *Mrs. Gordon Wightman*, Hudson River Conservation Society

Courses of Study

Two-Year Science Course for Gardeners

Economic Botany — 12 sessions, Monday evenings, 8 to 9 p.m.
Jan. 3 — Mar. 21, 1949 — Instructor: *Mr. G. L. Wittrock* $10

Plant Breeding and Selection — 12 sessions, Monday evenings, 9 to 10 p.m.
Jan. 3 — Mar. 21, 1949 — Instructor: *Dr. W. H. Camp* $10

Two-Year Course in Practical Gardening

Cultivation of Greenhouse Plants — 6 sessions on alternate Thursdays, 8 to 10 p.m.
Jan. 13 — Mar. 24, 1949 — Instructor: *Mr. Joseph W. Tansey* $10

Members' Day Program

Fletcher Steele, Landscape Architect, will address the opening Members' Day program of the new year in the first of three afternoon affairs to be given downtown. The program will take place at the New York Genealogical Society's headquarters, 122 East 58th St., Jan. 5 at 3 p. m.

TABLE OF CONTENTS

DECEMBER 1948

The Journal is published monthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Entered as Second Class Matter, January 28, 1936, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription $1.50. Single copies 15 cents.

JOURNAL

of

THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VOL. 49 DECEMBER 1948 NO. 588

The Oaks of Florida

By Erdman West

TREES give character to the scenery of any region. In Florida this is especially true because of the relatively flat topography. Of the several hundred kinds of trees with which Florida is blessed, the oaks are the most important by reason of both number and variety. Twenty-eight species or varieties have been listed as occurring naturally in this state. Over vast areas oaks are the predominating woody plants, be the soil wet or dry, hilly or flat, sand or clay. From the Atlantic Ocean to the Gulf of Mexico, from the Georgia line southward to Lake Okeechobee, with or without pines, the oaks hold sway. Only toward the extreme southern tip of Florida do they yield to other groups more tropical in adaptation.

On Streets and in Parks

A winter tourist making his first trip into Florida anticipates tropical vegetation and brilliant flowers on every side. He may feel somewhat disillusioned, therefore, until he reaches the southern half of our state. Nevertheless a visitor, especially from the North, soon becomes aware of a consistent difference in the appearance of the towns compared to what he has been accustomed to seeing. In contrast to the winter aspect of his home town streets, here there are avenues of large trees clothed with dense, dark green foliage. Most of these trees are oaks.

In fact, so generally are oak trees planted along streets and in parks in Florida that an aerial view of many towns resembles a forest with houses scattered through it. Three species of evergreen oaks have been used almost to the exclusion of all other trees in these street plantings. Ease of transplanting, rapidity of growth, and the evergreen character have probably been the main reasons for this nearly universal choice.

By far the most frequent species met with is the laurel oak (*Quercus laurifolia*) which has a well developed trunk and needs little pruning to

About the Author

NEARLY 24 years as a botanist in Florida have given Erdman West an intimate knowledge of the plants of the peninsular state where so many northerners spend their winter holidays. The aim of this article is to give the traveler—perhaps the resident, too—a closer acquaintance with the score or more of oaks which dominate much of the Florida landscape. Most of the oaks whose leaves are pictured here are illustrated and described in greater detail in "The Native Trees of Florida" which Mr. West recently wrote in collaboration with Lillian E. Arnold. The book, which was published in 1946, was reviewed in this Journal in January 1947. Mr. West is Professor of Botany at the College of Agriculture and Botanist at the Agricultural Experiment Station, University of Florida, where he went as Assistant Plant Pathologist in 1925.

become a well shaped tree. The lanceolate to elliptical leaves, 2 to 4 inches long, have flat smooth margins and are present on the twigs about 11 months of the year. The water oak (*Q. nigra*), a close second in popularity for street plantings, is similar to the laurel oak in all its characters excepting the leaves, which are broadened toward the tip so that they are obovate or spatulate in shape and fall about two months before the new leaves appear. The water oak puts out its bright green new leaves early, before any of the other oaks, a desirable characteristic in the eyes of many people. However, both laurel and water oaks are relatively short-lived, reaching maturity at 50 years or thereabouts, and large branches may fall soon after that stage is reached.

For several reasons the finest street tree for the South is the live oak (*Q. virginiana*), called "live" because of its truly evergreen nature. The trunk of this tree is less prominent, usually being divided into several massive spreading branches a few feet above the ground. The live oak flowers and unfolds new leaves while shedding the old ones so that it is never completely bare. The leaves are about the same size and shape as laurel oak leaves but are rolled over or slightly recurved at the margins. The acorns are elongated and borne in deep cups in contrast to the rounded acorns and shallow cups of the first two. In parks and large lawns, its natural habit with great arching branches, often as long as the height of the tree, give it a graceful grandeur not shared by any other native tree, oak or otherwise. For street planting where low branches would be a hazard, it must be pruned early to induce a taller main trunk. It requires about a century to attain full size and will stand for another without loss of large branches. In its natural habitat in low hammocks and lake margins, the long horizontal branches, often draped with Spanish moss, bring to

The live oak as it frequently appears as a shade tree on Florida's streets, in lawns and parks, ornamented with trailing strands of Spanish moss.

mind the ancient Druid temples. Although none of these three species now has any particular economic value, the live oak was once highly esteemed in ship-building. The naturally curved branches and hard tenacious wood were ideal for the construction of the ribs and knees of wooden sailing vessels. They were so valuable, in fact, that the first national forest reserve established in this country consisted of a large area of live oaks near Pensacola, Florida, set aside so that the Navy might never lack a supply of these raw materials.

Oak Trees in Florida's Hammocks

The hammocks of Florida are among the most important of the state's phytogeographic features. These are forested areas on fertile soil on which broad-leaved or hardwood evergreen trees predominate. Along with holly, magnolia, bays, and the above mentioned evergreen oaks, several species of deciduous oaks are prominent in hammocks. The white oak (*Q. alba*) is a familiar tree in the western extension of the state. As in the far north, forest-grown trees are tall and slender-crowned, while open-grown trees in yards and roadsides are much branched and round-topped. The light-gray bark, exfoliating in scaly plates, deciduous leaves, and sweet acorns are characteristic here as elsewhere. The wood is valuable but harvested white oak in Florida is exceeded in quantity by some of its relatives.

In a few of the higher hammocks along the rivers in western Florida, the chinquapin oak (*Q. muehlenbergi*) is relatively abundant. The bark is similar to that of white oak but the leaves are more nearly chestnut-like. The wood also is similar to white oak and is lumbered indiscriminately with it.

By far the most numerous and important species in the white oak group is the swamp chestnut oak (*Q. prinus*) with a much wider range than the other two. This tree is widespread in hammocks from central Florida north and west and because it is so common it has received numerous colloquial names. One of these, "basket oak," refers to the frequent practice of weaving thin strips of the straight-grained wood into baskets for cotton and other commodities. Forest-grown trees have tall straight trunks with few small branches and the pale scaly bark characteristic of its group. Lumber cut from this species far outstrips in quantity and value all other oak timber cut in Florida; in quality it is second only to white oak. The acorns, which are borne in deep rough cups, are the largest of those on any Florida oak, and are sweet. The fact that they are relished by cows as well as squirrels leads to another local name, "cow oak."

One of the least conspicuous oaks of the white oak group is the bluff oak (*Q. austrina*). The leaves are less deeply lobed than on the white oak and the acorn cups are smoother and deeper, but the bark is very similar. In Florida it occurs only in hammocks of the central and northern parts where it may attain large size if it escapes the lumberman's axe. The straight tall trunk supports a rather wide crown.

The Florida oak with the most beautiful leaves is the Shumard oak (*Q. shumardi*), a red oak that occurs in rich hammocks where the limerock deposits are only a few feet below the surface. As a result its distribution is rather sporadic and the tree is only locally well known. The cylindric crown is composed of delicately cut foliage set on a dark, massive trunk. The leaves are almost elliptical in shape but divided into 7 or 9 distinct lobes, the tips of each of which are further cut into 3 to 5 or more slender bristle-tipped points. The black oak (*Q. velutina*) is not a common tree in Florida but it does occur in hammocks in some of the northern and western counties. In general it is much like the Shumard oak in appearance but the bark is often nearly black, the leaves coarse, and the acorn cups thick and rough.

River Bottoms and Their Characteristic Trees

The alluvial deposits of river bottoms support as rich an arboreal vegetation in Florida as they do in other states. Here the ubiquitous water and laurel oaks are found in considerable numbers. The willow oak (*Q. phellos*)

Leaves and acorns of the laurel oak, about two-thirds natural size.

occurs sparingly along rivers in extreme northern Florida but it is nowhere as common as might be expected (or as some distribution maps would lead one to think!). The thin deciduous leaves are a distinguishing characteristic, though their narrow shape coupled with the tree's round acorns leads to confusion with the narrow-leaved forms of laurel oak.

One of the red oaks, the swamp red oak (*Q. pagoda*) occurs in the bottom lands along some northern Florida rivers. This is similar to the southern red oak but the leaves are pale and downy beneath and there are 5 or 7 narrow-pointed lobes. The resemblances are so strong, however, that some botanists make it a variety of southern red oak (*Q. falcata pagodaefolia*).

The typical white oak of the river swamps is the overcup oak (*Q. lyrata*). This species has the pale scaly bark of the group but the leaves are narrow, often showing thin "waists" near the middle where the indentations run almost to the midrib. The acorns are most peculiar, in fact unique among Florida oaks, for often they are almost completely hidden in the rough scaly cup. This unusual fruit probably serves well in the distribution of overcup oak since its low specific gravity permits easy water dissemination.

Dwarf Trees of the Flatwoods

One of the most conspicuous types of vegetation in Florida, and undoubtedly the most extensive, is the pineland, characterized of course by the presence of pines. There are two kinds of pineland, one low and flat, commonly called flatwoods, and the other high and rolling and referred to as high pineland. These two types of habitat, one very wet or very dry depending on the season of the year and the other always well drained, support very different kinds of oaks. The flatwoods usually appear destitute of oaks, as we customarily think of them, except for occasional live oaks near ponds but the flatwoods are the home of the two little oaks. One of them, the dwarf live oak (*Q. minima*), has leaves and acorns much like the live oak (of which it is sometimes considered a variety) but the lower leaves are much different with coarse spiny teeth, holly-like in appearance. This duplicity of leaf-shape is most confusing at first but it soon becomes a mark of recognition.

The other little oak, often called the scrub oak or runner oak (*Q. pumila*), is common in the flatwoods too but it is also found in many other areas. For instance, it forms conspicuous patches on the rocky pinelands south of Miami where few other oaks occur, or it may be scattered in the edges of hammocks all over Florida. It bears elliptic to lanceolate leaves 2 to 5 inches long without teeth or lobes. Its large numbers of round acorns promptly pop out of their cups at maturity. Although it seldom exceeds a yard in height, it occupies large areas, spreading by means of the well developed underground stems. These two inconspicuous little oaks furnish a surprisingly large amount of mast for range hogs and wild life in general.

Species of Quercus in High Pineland

The dominant tree on high pineland is or was the longleaf pine, but in many areas the frequent fires following destructive lumbering have prevented reseeding. The only evidences of the pine are the fire-blackened stumps, but this high well-drained pineland always supports a stand of several medium-sized oaks. By far the most common tree in these areas is the turkey oak (*Q. laevis*). The large leaves are divided into 5 to 9 narrow lobes each bearing several bristle-tipped teeth at the extremity. The leaves appear late in spring and turn brown in fall, but they hang on the coarse crooked twigs all winter, almost until the new growth starts. The thick gray bark is deeply and coarsely furrowed with rough vertical ridges between. This oak is widely used as firewood and thousands of cords are harvested for this purpose. Recent research has discovered valuable materials for tanning leather in the bark and twigs, but these are not yet being used commercially.

Turkey oak is often replaced in western Florida, especially on clay soils, by the blackjack oak (*Q. marilandica*), a tree of similar characteristics. Blackjack oak has distinctive leaves with large, broadly wedge-shaped blades, narrow end down, and almost no signs of serration or lobing.

Next to the turkey oak, the bluejack oak (*Q. cinerea*) is the most frequent tree in the high pinelands. As its botanical name indicates, it usually has an allover gray or ashy appearance caused by the numerous short hairs or pubescence with which the foliage and young shoots are clothed. This character and its small size distinguish it from the laurel oak, although its leaf shape and round acorns in shallow cups are very similar.

One of the white oak group, called the post oak (*Q. stellata*), is common on the high pinelands of western Florida. It is less particular about its habitat but always occurs on well drained soil. It is a small tree with gray bark and numerous branches, all of them nearly horizontal. The leaves have the lateral lobes next to the apex remarkably widened so that many of the leaves are almost cross-shaped. Although they turn brown in fall they persist on the twigs nearly all winter. As one travels eastward and southward toward Orlando, this species is replaced by a close relative, the

The Cover Picture . . . Quercus virginiana

The Treaty Oak of Jacksonville, photographed by Mrs. Fred B. Noble for the Journal, is probably one of Florida's oldest and most majestic trees. With an estimated age of 800 years, it has collected legends as it collects resurrection ferns along its branches. It apparently lived about as long before Columbus came to America as it has since that day. The trunk circumference of 15 feet is rather small for so widely spreading a tree. Branches measured recently were found to be 60, 66, 69 and 78 feet in length, but all have been cut where the ends have trailed on the ground. A measurement made some time ago recorded a length of 100 feet for one of the limbs. This venerable specimen of *Quercus virginiana* stands on Alvarez Street, about a block off South Main near the Main Street Bridge.

Dwarf oaks growing on Florida's scrub lands, in company with sand pines and *Etonia* palms.

dwarf post oak (*Q. margaretta*). Its characteristics are similar to the post oak but the leaves lack the broad lateral lobes. In many instances the ground around these trees is carpeted with a dwarf form, 2 feet or less tall, for several yards in all directions.

The largest oak of the high pineland is the southern red oak (*Q. falcata*). It forms nearly pure stands on rolling pineland especially near hammocks where the soil may have a somewhat higher fertility. The tall dark trunks support a rather open crown on large ascending branches. Its chief claim to distinction lies in its duplicity of leaf form, some trees producing only leaves with either 3 or 5 prominent lobes with deep rounded sinuses, while other individuals have leaves with only 3 indistinct lobes near the tip, and these showing almost no sinuses. Both forms are yellowish or brownish with pubescence beneath. Frequently both types may be found on the same tree. It is quite abundant but, on the whole, not a pretty tree.

Bushy Oaks of Scrubs and Sand Dunes

There are many miles of rolling sand dunes along the Atlantic and Gulf coasts of Florida. Farther inland there are extensive sandy areas with excessive drainage that are known to Floridians as "scrubs," often bearing names such as the "Big Scrub," "Sebring Scrub" and "Lake Marion Scrub." Most of these areas are clothed with sand pines, dwarf palms, and a low round-topped billowy vegetation consisting largely of a combination of ericaceous shrubs and small oaks. Any one of these types may predominate but the oaks are almost always present. Of these shrubby species, the most common is the myrtle oak (*Q. myrtifolia*), which occurs most commonly as a dense bushy shrub, often forming irregular thickets as tall as a man and almost impenetrable except to Florida jays and rabbits. On the coastal sand dunes, the prevailing winds cause the stems to lean inland and the tops there have such even contours that they appear purposely trimmed. In the scrubs where air currents are not so consistent, the trees are rounded except on the sides adjacent to other vegetation. The stiff stems branch intricately and, according to the fertility of the soil, they are covered sparsely or densely with dark green glossy foliage. The surface of the oval to oblong leaf, which is seldom as much as 2 inches long, is usually rounded in the center and depressed at the margins. The leaves fall gradually throughout the second year so that the tree is never bare nor is there any great accumulation of dry leaves on the sand at any one time. The tiny acorns a half inch or less long take two years to mature but are often produced in abundance. Occasional trees of this species reach 30 feet in height with crooked twisted trunks, but such individuals are not common.

Rolfs oak (*Q. rolfsi*) is a poorly understood tree of the lower Atlantic Coastal region. It is evidently closely related to the live oak but is a small rigid tree with an irregular crown and stiff twigs. The small, leathery, angular leaves are blunt at both ends and the short-stalked, usually paired acorns are half buried in their funnel-form cups.

Chapman oak (*Q. chapmani*), named for Florida's botanist, Dr. A. W Chapman, is widely distributed in the state as far south as the Everglades. Over most of the area it occurs as scattered individuals or colonies but in the "scrubs" it is much more abundant and conspicuous. It does not have the multiplicity of branches characteristic of most woody plants of these areas, and the obovate, frequently three-lobed leaves are somewhat larger than the rest. To those familiar with these areas it is distinguished chiefly by the yellow tinge to its foliage. Occasionally on better soil it reaches a height of 25 feet but the bushy form in the scrub is the conspicuous type.

Another oak of the scrubs, the sand live oak or twin oak (*Q. geminata*) is also widely distributed in other parts of Florida on excessively drained soil. It is frequently listed by botanists as a variety of live oak and has many characteristics in common with that noble tree but never attains the majesty of its relative. Among the chief differences are its more upright habit of growth, the narrow, reversed-boatshaped leaves which are pubescent beneath, and its liking for very dry situations. It varies from a low


1
2
3
4
5
1
6
7
14
8
15
18
19
9

shrub in the scrub to a tree 25 feet high with a trunk a foot in diameter on the better soils. In general it seems to reflect its semi-xeric habitat to a greater degree than any of its associates.

* * * * *

Whatever time of year the tourist comes to Florida he will find the oaks conspicuous and attractive, but at certain seasons they are more showy than at other times. In the northern states, oaks are noteworthy for their autumnal coloration, but in Florida only a few take on bright tints in the fall. The turkey oak, especially in dry years, assumes many shades of red, purple, and yellow—not brilliant but very pleasing, particularly in early morning or late afternoon sunlight. The southern red oak and a few others produce occasional highly colored individuals. However, Florida oaks put on a fine display of color in the spring. We have mentioned in passing the light green early spring foliage of the water oak. A little later there appear miles of high pineland tinted greenish yellow by the flowers and new leaves of the turkey oak and highlighted with soft grayish pink by the new shoots of bluejack. If there is a backdrop of dark green longleaf pine, the picture is completely beautiful. The scrubs present their most interesting color combinations when in their spring garb. Although there is a crazy-quilt pattern of golden browns, light and dark greens throughout the year, the new growth of spring adds the yellow-greens and pinks of the various bush oaks to brighten the rolling panorama of vegetation.

No matter what the season of the year, Florida oaks are interesting. From the yard-high runner oaks to the 100-foot swamp chestnut oaks; from the simple-leaved myrtle oak to the finely divided leaves of the Shumard oak; from the stark winter branches of the southern red oak to the gracefully majestic, moss-draped evergreen live oak, they offer a wide variety of form, detail and beauty. To enjoy and really appreciate them, one must come to see them.

LEAF OUTLINES OF THE PRINCIPAL OAKS OF FLORIDA

Laurel oaks: 1. *Quercus laurifolia*; 2. *Q. cinerea*; 3. *Q. pumila*; 4. *Q. myrtifolia*; 5. *Q. nigra*.

Red oaks: 6. *Q. laevis*; 7. *Q. shumardi*; 8. *Q. marilandica*; 9. *Q. falcata*; 10. *Q. falcata*.

White oaks: 11. *Q. prinus*; 12. *Q. muehlenbergi*; 13. *Q. alba*; 14. *Q. lyrata*; 15. *Q. austrina*; 16. *Q. margaretta*; 17. *Q. stellata*.

Live oaks: 18. *Q. minima* (lower leaves); 19. *Q. minima* (upper); 20. *Q. virginiana*; 21. *Q. chapmani*; 22. *Q. rolfsi*.

Puerto Rico's Christmas Tree

By Edward P. Hume

FOR almost 400 years the people of Puerto Rico have celebrated Christmas only as a religious festival in keeping with the tradition of the Spanish colonists. The giving of gifts, especially to children, is left for the "Día de los Santos Reyes," January 6, the anniversary of the Three Kings bringing gifts of gold, frankincense and myrrh to the newly born Christ in Bethlehem. But since the American occupation, Christmas day itself has come to mean more and more to the inhabitants. Before that time, the use of Christmas trees was unknown in Puerto Rico.

The problem of securing a suitable Christmas tree has led to the trial of a number of native species. In Puerto Rico there are practically no conifers or other narrow-leaved evergreens resembling those used in the temperate zone. Only a few of the introduced species make satisfactory growth, because of the lack of a dormant period in this climate. The choice is thus narrowed, for practical purposes, to local broad-leaved trees or imported evergreens. The TINTILLO or ESCAMBRÓN, *Randia aculeata,* a member of the Madder family (Rubiaceae), has come to be the one most widely used.

"Escambrón," meaning a plant bearing thorns, is the name most commonly applied to this *Randia*, but as it is used for several other plants as well, "tintillo" seems a better name,[1] for it belongs to this species exclusively. Other common names for the tintillo are TINTELLO, TANTILLO, PALO DE COTORRA, CAMBRÓN, PALO DE ESPINILLO, SOTACABALLO, inkberry, box brier, dogwood, and lately, Christmas tree.

The species is not confined to Puerto Rico; Britton and Wilson[2] list it as growing in several other West Indian Islands, also Bermuda, Florida, and possibly Mexico[3]

The tintillo is a relatively common plant in all parts of Puerto Rico, though seldom seen above 1,500 feet elevation. It flourishes particularly well on the north coast, even giving its name to one of the larger hotels in San Juan. In the well-drained limestone hills there, known as the Hay-

---

[1] The preference for this name has been expressed by Professor José Otero, phytotaxonomist of the University of Puerto Rico, whose assistance in preparing this paper is gratefully acknowledged.

[2] Britton, N. L. and Wilson, P. Scientific Survey of Porto Rico and the Virgin Islands **VI**: 230, 231. New York Acad. Sci. 1923.

[3] Another species, though one of questionable validity, *Randia portoricensis,* is found only in the drier sections of the island, where *R. aculeata* is depauperate. The chief difference appears to be the presence of thorns in sets of three at the tips of the branches in *R. portoricensis* as compared to pairs in *R. aculeata*. The JASMIN DE ROSA (*R. formosa*) which grows naturally in some parts of the Antilles, is cultivated in Puerto Rico and occasionally escapes into the wild.

stack Hills because of their shape, it often occurs in association with *Zamia latifoliolata.*

Seldom is the tintillo found growing alone in the open when young. Perhaps its close association with other plants is a shade requirement during the early stages of growth. This apparent need for plant companions is a handicap to its use as a small Christmas tree, for when growing in thickets the young plants have a tendency to be sparsely branched. A heavier growth can be induced, however, by removing the competing bushes and cutting back the plant the year previous to its use. In later years the

PUERTO RICO'S CHRISTMAS TREE IN ITS HOLIDAY ATTIRE

At the left, a specimen of *Randia aculeata* that has been cut, sprayed with aluminum, and set in a tub of water for an outdoor Christmas party at Mayaguez.

At the right, a small double-leader tintillo decorated for Christmas. This tree was growing in a dense thicket of other tintillos.

sparse branching habit disappears if the tree outgrows its competition or if additional stems develop from suckers near the base.

Each year, at the approach of Christmas, a small industry springs up near metropolitan San Juan, as woodsmen gather tintillos and bring them into the urban areas, offering them for sale at a price which is roughly one-half as much as for imported trees. They are still not commonly used in Puerto Rican homes, but their popularity increased tremendously during the war years when shipping limitations prevented the importation of balsam firs.

When these firs are shipped into the island they are apparently given no special care, and sometimes more than half the needles have fallen before the trees are put up for sale. The tintillo, while it lacks the dark green color nostalgically associated with Christmas trees, holds its leaves fairly well, especially if the base is mounted in water. At the Federal Experiment Station, trees pulled up with stumps of the main roots attached, then set in water, remained in good condition more than a week, even though exposed to sun and wind outdoors. In homes the trees are commonly expected to last from Christmas to January 6. The sharp spines make caution necessary in mounting and trimming but help to hold the decorations from slipping.

Tintillos, which may grow as either trees or shrubs, sometimes attain a height of 30 feet, occasionally more, but the trunks, generally 6 to 9 inches in diameter, are seldom large enough to be of use except as fence posts. The dark brown wood, which is said to be strong and durable[4] is close and straight grained, resembling lignum vitae, and it takes a very good polish.

Although the plant has never been used for hedges, so far as is known, it seems ideally suited for this purpose, the thorns making it difficult to break through. That it is easily adapted to any desired shape was shown some years ago when the Forest Service grew a few closely clipped trees. The specimens were fertilized as well as clipped, and they developed a denser growth and darker green color.

The tintillo has some value as an ornamental, although neither the greenish-white flowers nor the grayish fruits are particularly striking. It does not appear to suffer from diseases. The only insect observed attacking it is an unidentified gall worm which causes a slight swelling and fasciculation at the point of entry, but these swellings are not noticeable more than a few feet away. Little angel orchids, called here ANGELITOS (*Ionopsis utricularioides*) are often found attached to the branches.

Growing wild in all sections, the tintillo is usually available without cost to those who wish to cut their own Christmas trees. It is so prolific in seeding that there is little likelihood of its being exterminated.

Since trees given care are far superior to the wild ones, there seems to

[4] Murphy L. S. Forests of Porto Rico. U.S.D.A. Agr. Bull. #354. Washington, D. C. 1916. Appendix I. Bush, W. D., Murphy, L. S. and Mell, C. D. Trees of Porto Rico, page 96.

be a good possibility of clearing and pruning trees in preparation for future sales. Such treatment will increase the value, particularly of the smaller trees, more than the cost of labor involved.

The author is Horticulturist at the Federal Experiment Station, United States Department of Agriculture, Mayaguez, Puerto Rico.

NOTICES AND REVIEWS OF RECENT BOOKS

Odorous Oils from Plants— An Encyclopedic Study

THE ESSENTIAL OILS, Volume I: History, Origin in Plants, Production, Analysis. Ernest Guenther. 427 pages, illustrated, indexed. Van Nostrand, New York, 1948. $6.

The need has long been apparent for a new encyclopedic study of essential oils. The classic work in the field has not been brought-up-to-date for well over a quarter of a century, a period that has been rich in the recorded progress in man's knowledge of the botany of the plant materials from which the oils are obtained, in the methods of analysis of the oils, and in the chemistry of their constituents.

Although the perfumer and chemist must await the later volumes to obtain the full value of the work of Dr. Guenther, the botanist will find in this initial and largely introductory tome discussions of outstanding interest.

It has often been noted that the realm of the vegetable kingdom has indeed been enriched by the variegated odors emanating from flower and seed, bud and bark, leaf and root. How true it would be to reword this by stating that man's enjoyment of his biological function, his ability to smell, has been immeasurably enhanced by the presence of odorous oils in plant life.

But what are these oils? How are they formed? What role do they play in the plant? These are the challenging questions examined by one of Dr. Guenther's collaborators, Dr. A. J. Haagen-Smit, in one section of the present volume.

The oils themselves would, however, be valueless to man without a method of separating them from the plant. The processes by which the oils are obtained, their theory and practice, are examined by Dr. Guenther in another section that will likewise be of interest to the botanist, despite the necessary and justifiable excursions into the chemistry, technology, and equipment utilized.

Dr. Guenther is admirably suited for the writing of the present volume, because of a lifelong work and study in the field, and because of his unceasing efforts to verify by personal observation the validity of all data he presents. The later volumes will be awaited impatiently.

EDWARD SAGARIN,
Givaudan-Delawanna, Inc.

Strange Floristic Alignments

THE GEOGRAPHY OF THE FLOWERING PLANTS. Ronald Good. 403 pages, illustrated, indexed. Longmans, Green & Co., New York, 1948. $7.50.

Part I, occupying about half of Good's recent text, is concerned with a statistical and distributional study of families, genera, and species; it also includes chapters on the history and distribution of the British flora, a study of the distribution of the plants in an English county, and something of the geological history and past distribution of the flowering plants.

Part II takes up various phases of the factors of distribution (at considerable length), followed by a discussion of the

Theory of Tolerance, and a chapter devoted to Conclusions. There are appendices with interesting statistics on the world's land surfaces and a list of "discontinuous genera"

It is difficult, if not impossible to review this book with adequacy in so limited a space; while it has some points of value, there are many which mar it. In fact, one can but wonder at times on what bases the author's concepts of plant geography were founded; this is especially true when one examines his "Map of the World Showing Floristic Regions" (page 48). Fortunately, it is marked "Original."

For example, one finds that the "Atlantic North American" floristic region extends from about Lake Okeechobee, Florida, westward to the mouth of the Rio Grande, even taking in a bit of northern Mexico; from there the line swings northward, apparently along the Rocky Mountains, eventually turning westward in Canada; eastward, the line goes from Florida north to the Labradoran Coast, from there it swings westward across Hudson Bay to north of Great Slave Lake; for a time the two lines are roughly parallel as they continue westward, the southern then goes out to sea near Seward, Alaska, the northern one at about Nome; then, still marking the limits of the "Atlantic North American" floristic region, these boundary lines finally meet near Attu, the most westerly of the Aleutian Island chain!

One also is rather startled to learn from this map that all of Central America, much of Mexico, and even parts of California and Arizona belong in the "Caribbean" floristic area.

But these items, one can suppose, are merely to prepare one for placement of the Galapagos Islands in the "Andine" (Andean) floristic region, or to learn (as one does in the text) that the characteristic endemic plants of the "Brazilian" floristic region are the Victoria waterlily, the rubber tree, and the peanut. After such a naive and disknowledgeable treatment of the primary floristic regions of the Western Hemisphere one seriously doubts whether Professor Good's general conclusions on the relationship and development of floristic areas in other parts of the world are to be given much weight.

W. H. Camp.

Flowers and Their Early Names

OUR OLD-FASHIONED FLOWERS. Olive Percival. 245 pages, illustrated by John Maximus. Pasadena Humane Society, 1947. $5.

Every once in a while a book comes along that makes the reviewer ask, "Why did *this* volume happen to be published?" This is such a book. The body of it is made up of lists—Old-Fashioned Flowers: A Latin-English List; Old-Fashioned Roses: An English-Latin List; Pot Herbs, Sallet Herbs, Strewing Herbs and Simples: A Latin-English List, and so on.

Now, lists are necessary and useful, but these lists do not add much to many earlier collections of English plant names. Mrs. Percival has been diligent in hunting up old sources, although she doesn't exhaust them, but when she puts down more than fifty names for *Viola tricolor,* it seems a waste of good white paper.

You look in vain in the English-Latin list for "Daisy," but you can find "Dayesey," and "Dayezie" and "Day's Eye." "Percyl" and "Persylle" we are told, are *Petroselinum*; *"Percylle"* and *"Persil"* are *Ocimum.* I don't believe that the English writers made such nice distinctions. Many of the "common English names" are too obviously bookish—Lord Anson's Blue Pea, Deciduous Rhododendron, and Consul Chamberlayne's Bignonia are examples.

There is no definition of "old-fashioned flowers" in the book, but this reviewer would hesitate to include such plants as poinsettia and strelitzia in such a list. Many native wild flowers, such as trailing arbutus and calypso, seem out of place, too.

Squarely in the middle of the book is a seven-page bibliography. The entries are neither alphabetical nor chronological nor by subjects. If there is any order in this section, I failed to discover it. Curiously enough, none of the early English herbals is listed, although they are prime sources of information about old-fashioned flowers and their names. A bibliography of this kind that omits Turner, Lyte, Gerarde and Parkinson—to name but four out of many—leans too heavily on secondary materials.

I have saved to the last my comment on the first chapter, "Our Old-fashioned Flowers: An Essay on Flower Name History." It is misnamed. There is little history in it and, although Mrs. Percival writes with enthusiasm, her style is without the simplicity that her subject demands. She delights in archaic words and repetitious lists. Three times she tells us that "Meet-her-in-the-entry-kiss-her-in-the-buttery" is the longest flower name in the language. I guess it must be!

I wish that I might say some pleasant things about a book made with such loving care, but distinguished typography and an agreeable format are not enough, by themselves, to recommend a book to a reader. There must be worthwhile content, too.

ALBERT E. LOWNES.

Orchard Crops in Limited Space

DWARF FRUIT TREES. Lawrence Southwick. 126 pages, illustrated, indexed. Macmillan, New York, 1948. $2.50.

Dwarf fruit trees of the trained or espalier type have been available in this country for many years, mainly through importations from Europe and later by propagators here, particularly Henry Leuthardt of Portchester, N. Y. This type of tree has been planted more or less as an ornamental feature or novelty, and never seemed to gain much in favor as a means of producing fruit. In recent years a different type has appeared—the bush or untrained tree, and this is becoming quite popular from a utilitarian standpoint, particularly among those home owners whose grounds for growing fruit trees are strictly limited.

Lawrence Southwick in his book "Dwarf Fruit Trees" has set out to explain the advantages of this sort of tree and to give clear and concise information as to its culture. Of prime importance in producing these trees is the understock needed to induce the different degrees of dwarfing, suited to certain varieties of fruits, especially apples, which are very responsive to this treatment. Professor Southwick discusses this important matter thoroughly and with authority.

Chapters on planting and pruning, soil management and fertilization, pest control, propagating and harvesting are also included and go to make up a worth-while work. A chapter is set aside too for the espaliers.

The book is illustrated clearly and well by numerous photographs and drawings.

EDWIN BECKETT,
Superintendent, Middletown Farm.

Mushrooms for Beginners

KEYS TO THE COMMON FLESHY FUNGI. Clyde M. Christensen. 45 pages, illustrated. Burgess Publishing Co., Minneapolis, 1946. $1.50.

These simple keys to the more frequent fleshy, woody, and leathery fungi are well illustrated at critical points by sketches. The author has intended the volume "for beginners, both amateur and professional"; and since the most magisterial are apt to be beginners in those groups not chosen for intensive study, its field of usefulness should be wide. The book, like all such works, suffers from the disadvantage of incompleteness; the compensating advantage is usability, and this it possesses. There are a few errors, but mostly those fixed by long usage. It is recommended for the purpose of gaining a first acquaintance with the larger and more conspicuous fungi.

DONALD P. ROGERS.

Manual for Medical Students

BACTERIOLOGY AND ALLIED SUBJECTS. Louis Gershenfeld. 561 pages, illustrated, indexed. Mack Publishing Co., Easton, Pa., 1945. $6.

This book is apparently intended as a text for students interested in the medical and public health aspects of bacteriology. Although it is better balanced than most medical texts, it would not be satisfactory for use in most general bacteriology courses. In the first place the subject of bacteriology is treated very briefly and rather superficially, and secondly, the theoretical side of the subjects under discussion is usually passed over with only a sentence or two. For instance, the chapter on staining is taken up almost entirely with staining methods: the theory of staining is mentioned only briefly.

These shortcomings, however, do not detract appreciably from the value of the book as a medical text and reference manual. The descriptions of methods are excellent throughout, and several subjects are discussed which are not usually included in a book of this type—for example, bacteria in commerce and industry, animal parasitology, insect control, and allergy. The value of the book as a reference manual is greatly enhanced by the inclusion of a remarkably complete table of contents, so complete that it is essentially an outline of the book.

JEAN E. CONN.

Progress in the Caribbean

JOURNEY TOWARD THE SUNLIGHT. Stanley Walker 226 pages, photographs. The Caribbean Library, New York 1947. $2.75.

Since this book was produced by an agency registered with the U. S. Justice Department under the Foreign Agents Act, the reader might well suspect it to be propaganda for the Dominican Republic, and a brief glance at any chapter will confirm his suspicions.

Nevertheless, "Journey Toward the Sunlight" is a valuable book, for it compactly presents the history of the republic from the first voyage of Columbus, and it gives the Dominican view of the Haitian border dispute, one often overlooked in history books. It also gives the Dominican side of the invasion of that country by the American marines and the subsequent American control of the customs of the Dominican Republic. A report from the Dominican side is better than the usual repetitious defense of our own actions usually found in books on the Caribbean.

Walker describes the agricultural colony of Sosua, now a model refugee settlement in the Caribbean. He also reports on the outstanding agricultural program maintained by the government for irrigation of dry lands, reclamation of waste lands, and reforestation.

For anyone interested in the possibilities of development of the Caribbean this book tells as well as any yet written what can be done. It certainly makes clear that some of the program maintained in the Dominican Republic could be used with profit in other Caribbean countries.

R. A. HOWARD.

Plants to Cover Surfaces—With a Few Suggestions

CLIMBERS AND GROUND COVERS. Alfred Carl Hottes. 302 pages, illustrations, glossary, tables, index of plant names, general index. A. T. De La Mare Co., New York, 1947. $3.

"Climbers and Ground Covers" is really a reference book, with tables of zones, types of growth, and horticultural and common names. Unfortunately, these tables are at both front and back of the book, so that the constant searching required is wearisome. The book is valuable because of the variety of plants included and the excellent pictures shown, though it might have been wiser to omit some of the poorer climbers and to have put more emphasis on ground covers, which are important in these laborless days.

Ground covers are so desirable in difficult positions and for contrast of color and design that a few suggestions follow:

European ginger is the handsomest of all.

Native ferns flourish and make wonderful covers, especially the exquisite maidenhair.

Hosta (*Funkia*) grows in close formation and is effective.

Hydrangia petiolaris starts slowly but lies flat and thick.

Kenilworth ivy, a charming greenhouse pest, is indomitable.

Pulmonaria, with its large white-flecked leaves and early pink and blue flowers, is lovely.

Pyracantha hates the cold, but does splendidly if kept below snow level.

Inorganic substances are also feasible. Bits of brick, crushed colored stone, pebbles, sand, and even coal, make delightful patterns.

All these have proved satisfactory in a northern climate.

MABEL CHOATE,
Stockbridge, Mass.

Revised Reference in Pathology

DISEASES OF FIELD CROPS. James G. Dickson. 429 pages, illustrated, indexed. McGraw-Hill, New York & London, 1947. $4.50.

This book is an up-to-date revision of the author's "Outline of Diseases of Cereal and Forage Crop Plants of the Northern Part of the United States," published in mimeoprint form by the Burgess Publishing Co., Minneapolis, in 1939. Dr. Dickson has performed a great service in incorporating much of the widely scattered information on the major diseases of field crops into a generously illustrated volume. The text is divided into four major sections: (1) General introduction, (2) diseases of cereals and grasses, (3) diseases of legumes, (4) diseases of fiber and other field crops.

Although the book is most valuable to plant pathologists, other workers should find it useful for reference purposes.

K. W. Kreitlow,
Associate Pathologist,
U.S. Regional Pasture Research Laboratory.

Another Volume on Enzymes

ADVANCES IN ENZYMOLOGY, AND RELATED SUBJECTS OF BIOCHEMISTRY, Vol. VIII. Edited by F. F. Nord. 538 pages, illustrated, indexed. Interscience Publishers, Inc., New York, 1948. $8.

This volume is as varied in content and as international in authorship as its predecessors. Of the ten reviews, three are of interest to botanists. These are "Functioning of Cytoplasm" by L. Monné, "Alkaloid Biogenesis" by Ray F. Dawson, and "Certain Aspects of the Microbiological Degradation of Cellulose" by F. F. Nord and J. C. Vitucci. In view of the very careful editing of the "Advances" and the present cost of printing, the price is not excessive.

F. W. Kavanagh.

Short Cut to Botanical Learning

THE ESSENTIALS OF PLANT BIOLOGY. Frank D. Kern. 440 pages, indexed, illustrated. Harper & Bros., New York, 1948. $4.

The task of a text-book writer is not an easy one. This is particularly true of a text attempting an introduction to the vitally interesting and enormously complex biology of plants, and the important relation of plants to the society of man. The utmost skill and discrimination must be exercised to encompass a scientifically sound, balanced, and intellectually acceptable presentation of the fascinating subject within the covers of a book that will require the attention of the student for even the full academic year. How much more difficult, then, is it for a writer or teacher to compress so great an amount of pertinent information and experience into a book designed to occupy the student for a single semester.

Within the limitations of the task set, the present book attacks the difficulty well. It is pleasantly written, although necessarily often light. The illustrations are carefully chosen. The book will not burden the student who studies from it, and may help him in a short cut to learning. The writer has undoubtedly achieved the compromise that is made necessary in the writing of such a text for a short-term course in fundamental science.

Bassett Maguire.

Cone-Bearers in the British Isles

THE IDENTIFICATION OF CONIFERS. A. Bruce Jackson. 147 pages, illustrated, indexed. Edward Arnold & Co., London, 1946. $2.50.

Cone-bearing trees that are cultivated in the British Isles are ably illustrated and described in this convenient-sized hand book. Noteworthy specimens of each kind of tree are listed, the size as well as the location being given. The keys are conveniently based essentially on leaf characters. Detail drawings are provided for more than 50 species.

Timber Tales

OUR LIVING FORESTS. Joseph T. Hazard. 302 pages, 16 full page illustrations. Superior Publishing Co., Seattle, 1948. $4.

The woodlands of North America always make good reading, and Mr. Hazard has aimed at telling an entertaining tale in surveying the forestry situation on this continent from the day of Leif Eriksson to the present. He delves into history, tells stories of famous trees, and writes of the forest industry in its many aspects, what it has meant in the building of the country, of the dangers that beset it, not forgetting forest fires, and of the future for forests and the men who work in them.

A New Journal on Bryophytes

TRANSACTIONS OF THE BRITISH BRYOLOGICAL SOCIETY. Edited by F. A. Sowter. 64 pages. Cambridge University Press, 1948, $3.15 per part, $15.75 per volume.

The British Bryological Society has recently (September 1947) published the first number of a new Journal, "Transactions of the British Bryological Society." This replaces the "Reports of the British Bryological Society" (1923-1945) and contains the official proceedings of the Society, bryological notes, an annual bibliography of bryological literature, and in addition original papers. Bryological contributions of all kinds are welcome, and are not necessarily limited to works on British bryophytes.

MARGARET FULFORD,
University of Cincinnati.

Zest for Nature

A MULTITUDE OF LIVING THINGS. By Lorus J. Milne and Margery J. Milne. 278 pages. Dodd, Mead and Company, New York, 1947. $4.

This book by Mr. and Mrs. Milne, who are both trained as biologists, is the result of much study and first-hand observation of the smallest denizens of the animal world as they are found in the woods and by the sea—ants, worms, spiders, mussels and many more in the endless variety of living things. Not only are the authors deeply imbued with the scientific spirit, but they are gifted with lively imagination, a sense of humor, and enormous zest for the study of nature. Simple in style, the book is in the best tradition of popular science writing and could well serve as an introduction to awaken interest in what seem to be the inscrutable ways in which life has evolved.

EDITH BRODNEY,
P. S. 68, Bronx.

Burbank for Boys and Girls

LUTHER BURBANK, BOY WIZARD. Olive W. Burt. 188 pages, illustrated. Bobbs-Merrill Co., Indianapolis, 1948. $1.75.

One usually approaches a book about Luther Burbank with skepticism, but Olive Burt, in this children's tale, has provided logical motivation for the man's life work in her pleasant fictionizing of his youth. She wisely skips over the years of his long career, letting time pass without comment or dramatization from the day in 1875 when he left his home in Massachusetts to settle for the rest of his life in California. Then, in describing his birthday in 1911, when the school children of his adopted state are paying tribute to him, she pictures the much lauded character as the modest man he was at heart, a man who spoke with affection rather than boastfulness of his plant creations which the children clamored to know about.

CAROL H. WOODWARD.

The Ubiquitous Hobby

FLOWER ARRANGEMENT. A Hobby for All. Matilda Rogers. 72 pages, illustrated. Woman's Press, New York, 1948. $1.50.

Matilda Rogers would definitely inspire the reader of her book "Flower Arrangement" to try this hobby. The information, on the whole, is concise and clear. Suggestions for the use and care of fresh plant material, tricks and short cuts would be very helpful to beginners. They would, however, find themselves rather disappointed and confused following her suggestions on weeds and dried arrangements. Materials suggested for drying are not practical and mechanics for making them are most inadequate. The text seems better than the illustrations, which are sometimes contradictory. The hints on design secrets would be most helpful, but some important fundamentals seem lacking in the chapter on design.

MARGARET DODSON.

From the Northwest

WESTERN FLOWER ARRANGEMENT. Carl Starker. 112 pages, illustrated with photographs by courtesy of the Oregon Journal. Binfords & Mort, Portland, Oregon, 1947. $2.50.

Wild and cultivated flowers of the Northwest are used exclusively in the arrangements illustrated here. The introductory advice is concise, easy to read and practical. The principle of restraint in making arrangements is emphasized. The eight introductory chapters are followed by black and white photographs, well reproduced, with descriptions of flower arrangements that can be made in the West and Northwest at the four seasons of the year.

Notes, News, and Comment

Revised Edition. From the Oxford University Press has come a second edition of "Maintenance of Shade and Ornamental Trees" by P. P. Pirone. Done by offset, the book has been enlarged with the addition of the latest information on control of shade tree pests and diseases, with particular attention given to new protective chemicals. Sixteen titles have been added to the bibliography, which already contained a list of selected books and papers for each chapter. The first edition, which has been out of print for several years, appeared in 1941. The new volume sells for $6.50.

In Argentina. While attending the Second South American Botanical Congress in Tucumán, Argentina, Dr. & Mrs. Harold N. Moldenke have given several addresses in Spanish. Together they addressed the congress Oct. 12 on "Plantas Citadas en la Biblia." Mrs. Moldenke spoke the next day on "La Botánica en la Sístema Educacional de los Estados Unidos" and Dr. Moldenke talked Oct. 16 on "Bellezas Escénicas de los Estados Unidos." Mrs. Moldenke's lecture is being reprinted in Peru and Uruguay.

Dr. Moldenke, at the time of writing in mid-October, had collected about 200 numbers, around 1,000 specimens, of Verbenaceae, Avicenniaceae and Eriocaulaceae in the half-dozen countries which he had already visited. From Tucumán he was to go on a field trip arranged for the delegates through the provinces of Tucumán, Salta, and Jujuy, ascending to 12,000 feet in the Andes.

Speaking and Collecting. Dr. W H. Camp addressed the Garden Club of Cleveland and the Shaker Lakes Garden Club Sept. 28 on "Plant Exploration in Relation to Modern Gardens." He spoke before the Botany department at the University of Cincinnati the afternoon of Oct. 12 on "New Interpretations of Some Old Botanical Problems." In the evening he addressed the faculty and upper class and graduate students on "Genetic Structure of Complex Plant Populations." Before returning to New York he collected oaks and beeches on the Keweenaw peninsula of Michigan, in the driftless area of Wisconsin, the dune area south of Lake Michigan, across Kentucky, West Virginia, and part of Virginia, and in parts of eastern New York State and the Berkshires in Massachusetts.

Other Lectures. G. L. Wittrock addressed the Garden Club at Chester, N. J., Sept. 16 on plants used by the Indians. Dr. H. W. Rickett showed the Garden's two short films Oct. 15 for a hospital benefit at Lakeville, Conn., arranged by Mr. J. R. Swan. E. J. Alexander addressed the Little Gardens Club of New York City Nov. 1 and the De Witt Clinton High School Nov. 4 on his explorations in Mexico. Dr. William J. Robbins was speaker for the Division of Mycology of the New York Academy of Sciences Nov. 26 on "Some Observations on the Physiology of *Trichophyton mentagrophytes.*" The Men's Garden Club of New York heard Dr. W. H. Camp Nov. 4 on "Some Adventures in Plant Breeding."

On Leave. In October Dr. E. E. Naylor began a six months' leave of absence from the Garden, which he plans to spend in Texas and southern California. Details of the educational work, during his abscence, are in the hands of Carol H. Woodward.

Meetings. At the University of Wisconsin Oct. 25 - 27 Dr. William J. Robbins attended conferences on virus host cell relationships, sponsored by the National Foundation for Infantile Paralysis. On Oct. 15 he went to Philadelphia for a meeting of the committee on research of the American Philosophical Society.

Dr. W. H. Camp met with the commission on nomenclature of cultivated plants at the United Horticultural Council meeting in Ithaca, N. Y., Oct. 25.

Staff Conference. Reports from the September meetings of the American Association for the Advancement of Science and allied societies in Washington, D. C., were given at the Garden's staff conference Oct. 19 by Drs. F. W. Kavanagh, D. P. Rogers, and H. W. Rickett.

To Missouri. Dr. Jesse R. Singleton, who has been at the Garden on a four months' fellowship, working with Dr. Dodge, left Oct. 30 for a new position as Associate Professor of Botany at the University of Missouri.

Movies. While in California during August, Carol H. Woodward showed the Garden's two short color films, "The Gift of Green" and "Plants and the Life of Man," at the Huntington Library, San Marino, before staff members of the Library and Botanical Garden there, with invited guests from California Institute of Technology in Pasadena and California Polytechnic School in San Dimas. The same week "The Gift of Green" was seen by the botany department of the University of California in Los Angeles, and later it was shown to the Los Angeles County Museum botanical staff. Some 300 members and guests of the Southern California Orchid Society viewed the two films at meetings on Sept. 13 and Oct. 11.

Short Wave. A. C. Pfander appeared on one of the foreign language broadcasts on the State Department's short wave program, "Voice of America," with a description of the New York Botanical Garden and what it means to the people of this country. The record, made in New York, was broadcast to Munich in September, then rebroadcast to German-speaking stations throughout Europe.

Mrs. David E. Oak. The sister of Mrs. N. L. Britton, Mrs. David E. Oak, died in New York Sept. 27. She and her daughter, Miss Dorothy Oak, who survives her, and who is a teacher in the New York public schools, have taken an active interest in the New York Botanical Garden since the days of its founding.

Visitors. Studying the genus *Ilex,* Miss Shiu-ying Hu of the Arnold Arboretum spent the day at the Garden Sept. 20. She was accompanied by Miss Chin-hsiei Tai, a graduate student at Harvard University. Several days previously Miss Ching-yung Chang worked in the herbarium on the Magnoliaceae. From here she went directly to Radcliffe College, where she was to begin graduate work toward a Ph.D. degree.

Dr. S. F. Blake of the U.S.D.A. at Beltsville, Md., spent the last week of September in library research at the Garden.

Recently returned from a collecting trip in the West, Rupert C. Barneby of Wappingers Falls, N. Y., visited the Garden Sept. 27.

Robert L. Crocker, who has just completed eighteen months of research at

Cambridge University, spent several days at the Garden in late September in further study and discussion of problems of range plant control. After a tour of the United States, during which he is scheduled to visit numerous institutions and meet ecologists in all sections of the country, he will return to Australia where he is on the staff of the Waite Agricultural Research Institute at the University of Adelaide.

Alvaro Goenaga, Plant Pathologist for the Tobacco Institute in Puerto Rico, spent two days at the Garden in late September.

Nina H. Loomis, Algologist from the Hancock Foundation of the University of Southern California, investigated specimens of West Coast algae in the herbarium for two days in September.

An early October visitor was Dr. A. Frey-Wyssling of the Institute of Technology at Zurich. Dr. Wyssling is the author of "Submicroscopic Morphology of Protoplasm and its Derivatives," which will be reviewed in this Journal, and "Die Staffausscheidung der Höheren Pflanzen."

Bernard Strauss, who formerly worked in the Garden's physiological laboratories, returned briefly in August in connection with his graduate work at the California Institute of Technology.

Among other visitors to the laboratories have been Dr. Max Delbrück of the California Institute of Technology; Dr. A. H. Doermann, Carnegie Institution, Cold Spring Harbor; Dr. Warren Weaver, Director of the Rockefeller Foundation; Dr. Alfred Gellhorn of Columbia Physicians and Surgeons Hospital; Colonel William J. Allen, Jr., of the Economic & Scientific Section of the U. S. Army from Tokyo, Japan; Dr. Gleb Krotkov of Queens University, Ontario, Canada; Dr. Sam Wildman of California Institute of Technology.

Additional visitors to the Garden have included R. Kent Beattie, Beltsville, Md., Dr. Lewis P. McCann of the U. S. Department of Agriculture, and Professor George B. Rigg of the University of Washington, Seattle.

Subsequent visitors have included Tobias Lasser from Caracas, Venezuela; Carlos Muñoz, Santiago, Chile; Henry M. Anderson, Fresno, Calif.; Marion A. Johnson, Rutgers University; Ralph Emerson, University of California; Karl Folkers and Eugene L. Dulaney from the research laboratories of Merck & Co.; Henry Teuscher, Superintendent of the Montreal Botanical Garden; B. O. Mulligan, University of Washington Arboretum, Seattle; K. Silberschmidt, Instituto Biológico, Sao Paulo, Brazil; T. A. Jukes and Dr. Hoffman of Lederle Laboratories; Bernice Seaver of Cabarrus County Hospital, Concord, N. C.; J. W. Foster of the University of Texas, and John A. Small of New Jersey College for Women with a group of seven students.

Student. Howard C. Reynolds of Nebraska, a graduate student at Columbia, is registered for studies in taxonomy at the Garden. He was formerly an instructor in botany at Texas A. and M. College.

Park Planting Privilege. Through the Park Association of New York City, Inc., citizens are being given an opportunity to beautify their parks and parkways with flowering shrubs and trees. Contributions ranging from $2.50 up, sent to the Park Association at 119 E. 19th Street, New York 3, N. Y., will be used exclusively for the actual planting of selected shrubs or trees in areas where they are most needed.

The Park Association's program to encourage planting was opened Sept. 28 as part of the celebration of New York City's Golden Anniversary. Memorial plantings are being particularly suggested. Each donor will be permitted to designate the borough and the park or parkway in which he wishes his gift to be planted. Wherever desired, plaques bearing the name of the contributor or of the person commemorated will be placed beside the plantings.

The minimum contribution will provide for a single forsythia or rugosa rose; the cost of laurel is $12; of an azalea $15; flowering cherries and dogwood trees range from $18 to $30 each, depending on size. The Park Department has prepared a list of needed plantings in all boroughs and the kinds of plants which will fit each area most suitably. This list is available to the public. Contributions to the Park Association's fund are tax exempt. Business houses, chambers of commerce, neighborhood organizations, and other groups, as well as individuals, will have the privilege of contributing to the planting fund.

INDEX TO VOLUME 49
1948

All botanical names mentioned in the Journal during the year are included in the index below, *except* for the list of nearly 200 plants of economic use that were shown in the Botanical Garden's exhibit at the International Flower Show (to be found on pages 95 to 99) and the list of flowers dried in borax by Frances R. Williams (pages 252 and 253).

Common names of plants are included only when they are the subject of an entire article.

Asterisks indicate illustrations.

From the monthly Notes, News, and Comment, only those entries which are of possible biographical or historical import have been entered in the index.

Books reviewed are listed alphabetically by author's name at the end of the general index.

The table of contents for the year will be found on the pages immediately preceding page 273.

A

B

C

P

Q

R

S

OOK REVIEWS

To reach the Botanical Garden, take the Independent Subway to Bedford Park Boulevard station, use the Bedford Park Boulevard exit and walk east. Or take the Third Avenue Elevated to the Botanical Garden or the 200th Street station, the New York Central to the Botanical Garden station, or the Webster Avenue bus No. 41 to Bedford Park Boulevard.

Membership in

THE NEW YORK BOTANICAL GARDEN

and what it means

TO THE INSTITUTION, membership means support of a program that reaches several hundreds of thousands of persons annually.

Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

TO THE INDIVIDUAL, membership means, beyond the personal gratification of aiding such a program, these privileges:

Free enrollment in courses up to the amount of the annual membership fee paid.

A subscription to the Journal (published monthly) and to Addisonia (issued irregularly).

Admission to Members' Day programs and use of the Members' Room also at other times.

A share of plants when made available for distribution. (These plants may include the Garden's new introductions into horticulture.)

Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

Business firms may become Industrial Members of the New York Botanical Garden. Information on the classes of Industrial Membership and the privileges of membership will be sent upon request.

* * * *

Classes of membership in the New York Botanical Garden in addition to Industrial Memberships are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
Sustaining Member	25	Fellow for Life	1,000
Garden Club Affiliation	25	Patron	5,000
Fellowship Member	100	Benefactor	25,000

(1)

Contributions to the Garden may be deducted from taxable incomes.

Contributions to the Garden are deductible in computing Federal and New York estate taxes.

A legally approved form of bequest is as follows:

I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of*________________.

Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*