

The reason most people, including myself, enjoy growing daffodils is that they thrive, even when totally ignored. Cottontails in my garden destroy crocus about as fast as they emerge from the ground. Roses, unless treated regularly for Japanese beetle, black spot, and powdery mildew, are soon an unhappy, unthrifty lot. But "good ole" daffodils; I can plant them anywhere, and in spite of grass, weeds, poor clay soils, and hard cold winters, I get a wonderful show. In fact, many of the blooms to my untrained eye appear to be bench, blue-ribbon winners.

I feel certain you, too, walk in your garden with the uninitiated visitor who marvels at your wonderful skill in gardening. Little does he realize that with daffodils, it is hard to fail. They are the flowers for the casual weekend gardener or the expert.

One of the big reasons daffodils do so well in my garden and in yours is that they are attacked by relatively few insects, diseases, and other pests. "Oh," I can hear you say, "that's what you think." Suppose daffodils were like red clover, which is attacked by over 200 different species of insects feeding on every portion of the plant from the pollen to the nodules; or corn, which is assailed by over 250 species of insects. Daffodils are bothered by less than a dozen important pests, and for the home gardener only two or three of these are really destructive. I would like to discuss these for you and suggest how you might care for them in your home garden.

BULB FLY

Among the most troublesome of the daffodil pests is the maggot of the narcissus bulb fly. We entomologists call it *Lampetia equestris* Fabricius when speaking of it in scientific writings. The

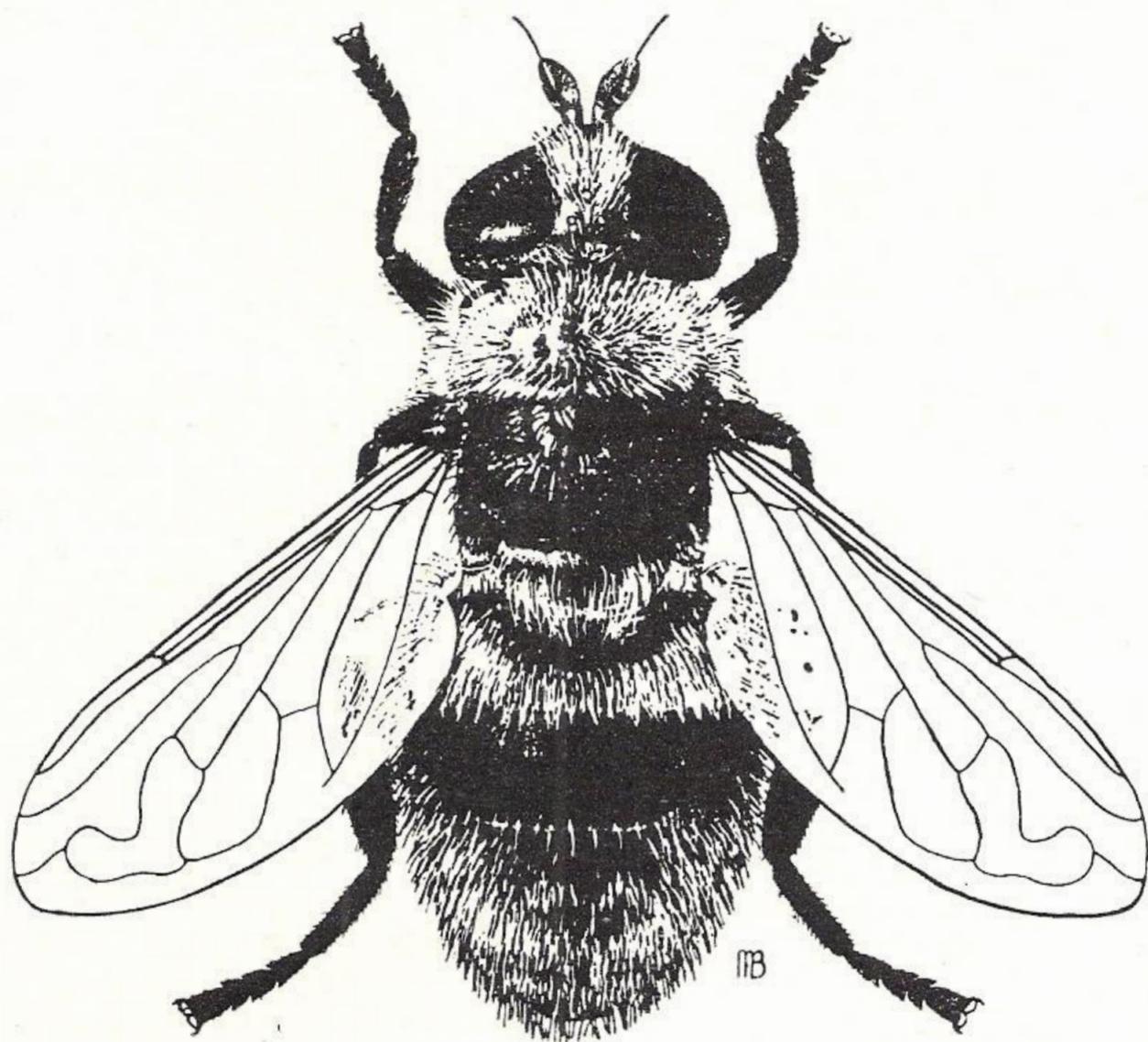
bulb fly occurs throughout the United States wherever daffodils are grown. In New York it is most common on Long Island and southern New York, where daffodils are also most commonly grown. The bulb fly larva feeds on daffodils and other hosts as well. Some of these are *Muscari*, *Iris*, *Gladiolus*, *Scilla*, *Lycoris*, lilies, and others. In general the bulb fly appears to prefer *Narcissus*. In home plantings, infestation may reach as high as 50 to 75 percent of the plants, although usually it is more often in the 10 to 25 percent range. In commercial plantings, where control is generally practiced, infestations may only range from 1 to 10 or 15 percent.

The adult bulb fly resembles a bumble bee in color and flight habits. It may be seen on sunny, warm days buzzing and zigzagging low around your blooms, but instead of pollinating them it is laying eggs. The adults are about $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long and their black hairy bodies are encircled with bands of yellow, buff, and orange. In New York the first bulb flies appear in late April or early May with the first daffodil blooms and continue to emerge during the entire blooming season. The flies mate and the female begins laying eggs. The tiny white eggs are laid and placed singly on the leaves at the base of the daffodil plant (at the neck) near the soil surface, although they may be scattered on the ground or in cracks in the ground. The eggs hatch in a week to ten days or more depending on the temperature. The young legless larva or maggot burrows down along the side of the bulb and enters it at the junction of the roots and base of the bulb, entering the basal plate through the root ring. Usually, there is only one maggot in each bulb, although there may be two, three, or rarely even more. The maggot

feeds on the basal plate and then tunnels with its hooklike mouth parts up into the scale region of the bulb, consuming much of the tissue. Here it passes through three different distinct sizes of maggot stages or instars, as it tunnels back and forth and finally upward. The maggot which is now wrinkled, plump, and greyish white to a yellowish tan passes the winter in the bulb. In early

dries its wings before mating and starting its life cycle over again. There is only one generation a year, although in some cases two years are necessary to complete larval development.

The best control of the bulb fly is based on protection of the bulb. A number of insecticides have given excellent results. Among these are aldrin, dieldrin, chlordane, endrin, heptachlor,



TC-7188B

PLATE 42

NARCISSUS BULB FLY

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spring, it resumes activity and burrows out of the bulb and up near the soil surface. Here the maggot pupates within its last molted skin which forms a hardened pupa called a puparium. The puparium is hard, rounded at the ends, and dark brown to black. It has a breathing tube and a convenient escape hatch. The fly remains in the pupal stage 30 to 75 days or more depending on the soil temperature. The fully developed fly pushes out the escape hatch and works its way up into the plant where it flexes and

Telodrin, and Thiodan. Others such as lindane, phorate, and Systox will work but are either too toxic to the home gardener to use or may cause injury to the bulb; but more on control a little later.

APHIDS AND VIRUS

The insecticides last mentioned are systemic and particularly effective on aphids and to a lesser extent on mites, leafhoppers, and thrips which are involved in the transmission of virus dis-

eases of *Narcissus*. Virus diseases are mainly the concern of the commercial large scale growers who must practice vigorous roguing or weeding out of diseased plants whenever these appear in their plantings, as these diseased bulbs will retain the virus and pass it along to the newly formed bulbs which are usually smaller and less thrifty in appearance.

The home gardener will find that it pays to learn the symptoms of virus diseases and rogue coldbloodedly, too. Affected plants show green color that is unevenly distributed or streaky. The plants are decidedly reduced in size and vitality. Such plants should be pulled and destroyed by burying or being cast into the garbage can. Never place it where it may infect others from the compost heap.

Seven aphids are proven vectors of *Narcissus* mosaic or virus disease. The most common of these are the pea aphid, the rose aphid, and the potato aphid. As these names indicate, these aphids feed primarily on other crops found near our homes.

Good aphid control will not insure virus-free daffodils, as only a few infected insects feeding for a very short time can transmit the disease. Therefore, the best defense remains pulling and destroying the infected plants.

Recently Floyd Smith and Stanley W. Jacklin have been finding that the use of silver foil seems to repel aphids, and they are getting some success by lining the spaces between rows with foil. It is a bit early to say whether we can depend on this method to insure virus-free plants. At any rate, insecticides have not as yet solved the virus problem on daffodils in spite of their effectiveness in killing most of the bugs. You might want to try the new foil method.

Viruses are discussed in greater detail under diseases in Chapter 8.

CONTROL OF BULB FLY

For controlling the larvae of bulb flies, commercial growers make up an emulsion, usually of dieldrin or heptachlor, using one-half to one pound of toxicant to 50 gallons of water and add-

ing a fungicide, such as formalin at the rate of 1 quart, or phenyl mercuric acetate (1 to 2 ozs.), to the water.

The bulbs to be treated are placed in wire baskets or loosely woven onion bags and then suspended in the emulsion ten minutes to an hour—usually ten minutes are enough. The bulbs are removed in the containers and hung to dry. They are now ready for planting. For commercial growers, I think this is a good practice, but for the average home

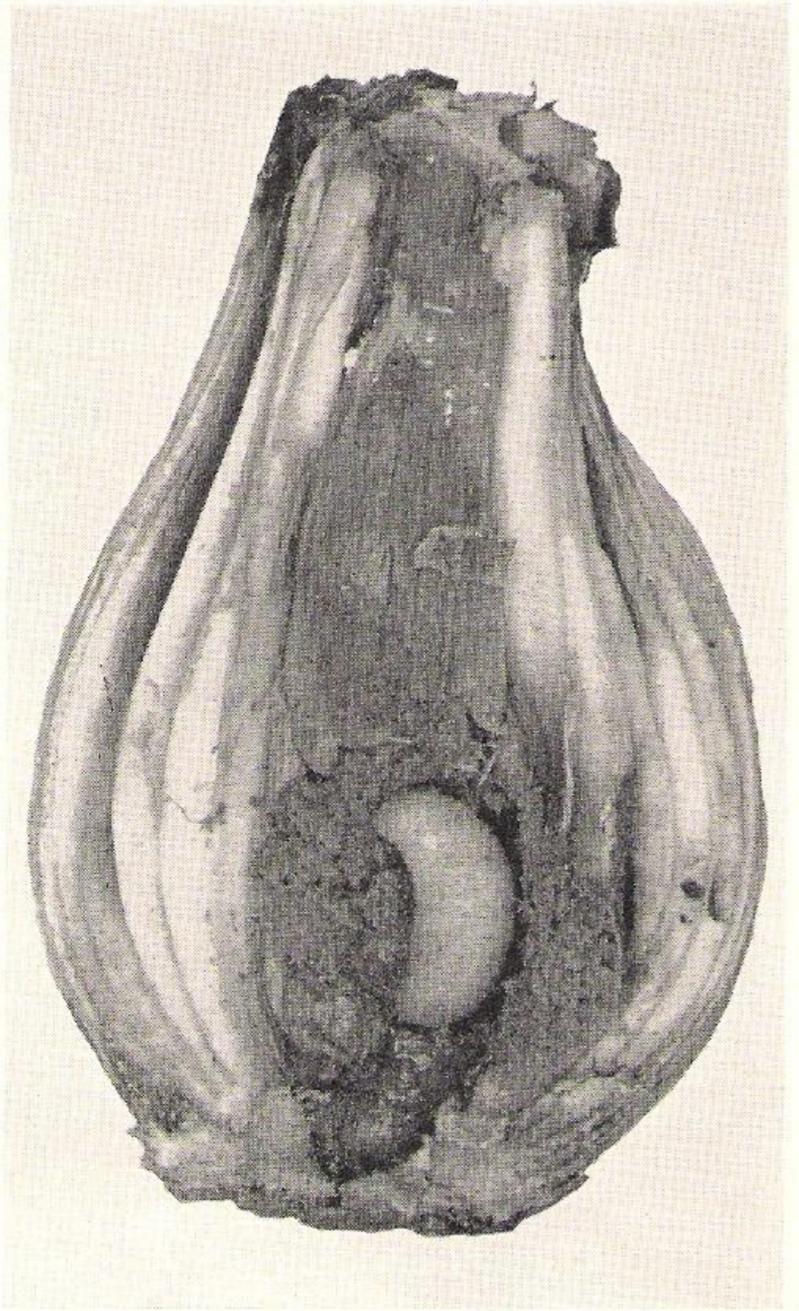


PLATE 43

U. S. DEPARTMENT OF AGRICULTURE

NARCISSUS BULB FLY

The legless larva or maggot burrows up into bulb from base.

gardener there are easier and much safer ways to treat the bulbs. Aldrin, dieldrin, chlordane, and heptachlor may be fatal poisons if swallowed. Skin contact with the emulsifiable concentrates is dangerous. The fumes, vapors, or spray mists can also be dangerous. If you wish to use the soak treatment, handle the insecticides and treated bulbs with sound

rubber gloves; work in a well-ventilated area, preferably outside; and after treating the bulbs take a hot soapy bath and change into clean dry clothes including your shoes and socks. Plant and handle the treated bulbs only with tight rubber gloves.

Even though I am a professional entomologist and have handled literally tons of insecticides, I prefer to treat my bulbs in the following manner. First I remove any loose scales and dirt from the bulbs, then I roll them in a powdered fungicide, such as Ceresan or Arasan (others may be used), to protect against basal rot. Then I dig my holes or planting trench (for seedlings and bulbs for cut flowers). Using 5% granular formulations of heptachlor or dieldrin, I treat the bottoms of holes or trench; I find a teaspoonful per bulb hole is just about right. The bulbs are set in place, lightly covered, and an additional teaspoonful is added on top of the bulb. Finally the hole is filled and tamped firmly. No dust, no fumes; clean and safe.

During dry summers such as we have had for the past several years in New York, I fill each hole with water ten minutes before I begin to plant. This gives the newly planted bulb a fine start. After the water has disappeared, I start adding the granular insecticides.

Granular insecticides can be purchased from the larger farm stores or commercial fertilizer plants but not as readily in the small hardware store on the corner. All the larger agricultural chemical companies, such as California Chemical Co., E. I. Dupont de Nemours and Co., Geigy Agricultural Chemicals, Shell Chemical Co., Velsicol Chemical Co., and others, maintain offices throughout the United States, Canada, and, in fact, the world. Granulars should be readily obtainable in your area.

Some home growers might prefer to plant the bulbs in place and just prior to covering treat them with an emulsion spray of aldrin, chlordane, dieldrin, endrin, or heptachlor. Others might prefer to use a garden duster with 5% dust formulations, but for my money I'll take the granules. Granulated insecti-

cides are just about dust free; they are freeflowing, easy and clean to handle. I much prefer them to dusts, or even sprays. Hand sprayers are notorious for clogged nozzles and leaky hose connections. I use a portable hand sprayer for aphids, thrips, and mites, but I don't like it and think a good, leakproof, easy-to-care-for one has yet to be built.

After the blooms have begun to fade, I like to run a hand-operated lawn fertilizer spreader over the plants filled with 2 to 5 percent heptachlor, dieldrin, or aldrin granules. These fall into the spaces between the leaves, stems of the plants, and the soil. Here it leaves a good residue toxic to both the bulb fly larvae and the flies. Following such a bulb-treating program, I have kept my bulbs free of such "soil inhabiting" pests as the bulb flies, lesser bulb flies, wireworms, Japanese beetle grubs, and June beetle grubs.

LESSER BULB FLY

Frequently daffodil bulbs are found just about rotted and full of maggots. These are often accused of being bulb flies, when actually they are lesser bulb flies. Lesser bulb flies belong to the genus *Eumerus*, and there may be several species involved, but the most common of these is *Eumerus tuberculatus* Rondani, known as the lesser bulb fly.

Unlike the bulb fly, the lesser bulb fly prefers injured bulbs, particularly those injured by frost, nematodes, or cases where basal rot has set in. The larvae do not infest sound, healthy bulbs or dry bulbs in storage, but only appear to be able to enter bulbs affected by decay and disease.

The eggs, as in the case of bulb fly, are small and white and are laid close to the necks of the bulbs; being deposited in groups of 3 to 15, closely side by side, in neat little clusters. The little maggots emerge from the eggs and enter the soft, decaying tissue. Twenty to a hundred or more may enter a single bulb, although usually 20 to 30 or 50 are the usual number. The maggots are legless, dirty yellowish and only about $\frac{3}{8}$ inch in size. They pass through a life cycle

much as the bulb fly except that there are two generations a year in parts of New York, and two and a partial third on Long Island. There is much overlapping of sizes and generations throughout the state.

The methods of control outlined for bulb fly are applicable to the lesser bulb fly.

NEMATODES

According to Thorne, the bulb and stem nematode *Ditylenchus dipsaci* (Kuhn 1857) Filipjev 1936 was first recorded in 1825 by Schwertz who described certain diseases of rye, oats, clover, and other crops but did not observe the nematodes. His characteristic descriptions indicate that he had the eelworm but did not recognize it as such from the symptoms. The causal agent was uncovered in 1867 by Kammodt. In the meantime, Kuhn in 1857 discovered *D. dipsaci* in teasel and described the nematode for that plant. He redescribed unknowingly the same nematode from other plants several others times, as did other workers who assigned new and different specific names to populations on different plants, rather than presenting good diagnostic characters so that the nematodes could be recognized. Much confusion as to names remains to the present day. The nematode has a wide range of host plants, ranging from daffodils to phlox, strawberry, red clover, alfalfa, onions, rye, potatoes, tulips, sugar beets, and mint. In fact, there are over 450 known host plants of 44 different families.

How can you tell if you have nematodes or eelworms? Leaves of badly infested daffodil bulbs bear elongate swellings called "spikkles." These can be detected by stripping the leaf between the thumb and finger. In later, more advanced stages, the spikkles become yellow or brown in the center and may break down into small dead spots. In the late summer, when the leaves are dead and the bulbs mature, the nematodes will be found lying quiescent in the dry leaf tissues. Entrance into the immature leaves is made from the bulbs, it is believed, through the stomata. Some

of the nemas go down into the scales where the leaves originated. After the nematode colonies become established, they form brown spots in the bulb scales which become larger gradually until the entire scale is involved. In the more advanced stages, brown rings can be seen if the bulb is cut in two. The flowers and leaves from infested bulbs are deformed, usually stunted, and often bear spikkles. Under very severe infestations, the bulbs may fail to produce any blooms.

Nematode reproduction will continue during bulb storage and often bulbs break down completely in storage. Badly decayed bulbs are not good homes for nematodes and the nemas often emerge from the bulbs near the basal plate in a woolly-like mass which is spread by the shoes of workers or by machinery to clean bulbs. If infested bulbs are planted, the nemas can migrate through the soil to other clean bulbs.

Other nematodes of the genus *Pratylenchus* are found in most soils of the Northeast. There is much confusion as to species and host plants, with *penetrans* and *pratensis* being confused, even by scientists. *Pratensis* does feed on daffodils in the Netherlands and has been found in New York on grasses and legumes, widely distributed. I think it more widespread than *Ditylenchus dipsaci* but much less important to the daffodil grower. At any rate, the chemical fumigation suggested for *dipsaci* will also destroy *Pratylenchus*.

CONTROL OF NEMATODES

Control of nematodes in bulbs is usually done using the hot water treatment which is said to have originated with J. W. Barr in England in the early 1900's. Later Ramsbottom in 1918 developed the 3-hour immersion treatment at 110° F. In the United States, this treatment failed to give the desired results in many cases, so a modification of the hot water was made in 1940 by Chitwood and Blanton, who found that one pint of formalin added to 200 gallons of water greatly improved its effectiveness on nematodes. Later it was found that a warm water (75° F.) plus wetting agent

presoak prior to treatment further improved its effectiveness. At the present time the Plant Quarantine Division of the USDA uses 4-hour immersion treatment and recommends this schedule to daffodil growers in the Pacific Northwest. With your own bulbs, be certain to remove badly decayed bulbs prior to treatment with hot water, because with such bulbs 80 to 90 percent of the nematodes survive. Complete kills, however, can be made in bulbs with only slight infestations.

Nematodes can be controlled successfully in the soil using a soil fumigant. One of the best of several soil fumigants is Telone. It is a D-D mixture of chlorinated C₃ hydrocarbons, including 1,3-dichloropropene, 1,2-dichloropropane and related compounds. For sandy soils 25 gallons are used per acre, but on heavier clay soils 30, or even 40, gallons are needed per acre. The fumigant is injected in small areas using a hand injector at depths of about 6 inches in holes spaced 10 inches apart. For light sandy soils and small areas, it may help to cover the treated areas for 48 hours with a plastic sheet or a canvas cover to prevent a too rapid loss of fumigant from the soil. If the fumigant dissipates too rapidly, incomplete kills of nematodes will result. It is best to fumigate in July or early August when soils are warm and allow a period afterward for the fumigant to leave the soil. One should allow a minimum of three or four weeks before planting to daffodils again. Since the fumigant will cost \$65 to \$125 or more per acre, depending on the type of soil treated and the amount

of fumigant needed, it is obvious that treating large areas will be expensive. Commercial growers will want to rotate their bulb crops every six years. While volunteer bulbs are removed for the first three years, grain cover crops are usually grown. This is followed by three years of grain, hay, or row crops during which time weed host plants of the nematode are kept to a minimum. Sanitation measures in your garden and storage areas are most important. Leaves and stems should be gathered and burned in the field. Care should be exercised where soil, fragments of infested bulbs, nematode "wool," etc., are discarded. There is no easy way for a home gardener to handle the nematode problem short of discarding all infested bulbs and practicing good sanitation. Fumigation of small areas is fine if a trained man is hired who knows what he is doing and has the necessary equipment to do it. Some success can be achieved by plowing, treating with a watering can, and rototilling the soil well.

Nematodes are also discussed in Chapter 8.

You have all heard much of the pesticide controversy and, being unfamiliar with pesticides, you may be greatly concerned with their use in your daffodil plantings and flower gardens. There is no question that any pesticide can be misused, but if you use them wisely according to the directions of your state college or the U. S. Department of Agriculture, they can be a wonderful tool for you in your home garden. The safest rule to follow is do not experiment and follow directions precisely.

Daffodil diseases need not be major problems for the home-owner or the hobbyist if the bulbs are given reasonable care. This includes: planting in locations having good air and soil drainage; avoiding excessive use of nitrogen, phosphorus, and organic matter; changing plant locations at least every other year; removing flowers as soon as they wither and diseased leaves or plants as soon as they appear; avoiding bruising, sunburning, or overheating when digging; and storing in a cool, dry place until planting. These practices should minimize the disease problems which are described in this chapter. The recommendations are designed primarily for the home gardener. Additional information is contained in several of the recent books on daffodils and in the *Handbook on Bulb Growing and Forcing* published by the Northwest Bulb Growers Association in 1957.

POOR GROWTH

Stunted or yellowed growth is often a reaction to poor growing conditions, but it may be caused by fungus and nematode attacks. The most common pathogen is the *Fusarium* fungus which produces the basal rot of bulbs; a less common parasite is the root lesion nematode which feeds on roots, and occasionally other pathogens are responsible.

BASAL ROT

Basal rot is a serious and worldwide problem but more destructive in warm climates than in cooler areas, such as the Pacific Northwest. The fungus spreads rapidly in the soil at temperatures of 65° to 75° F. Temperatures below 55° retard spread and infection. Most large trumpet varieties are susceptible, particularly the white and bicolor

types. Golden Harvest usually is much more susceptible than the common King Alfred. The jonquils, tazettas, triandrus, and cup types are usually resistant.

Plants from bulbs infected with basal rot are stunted, yellowed and often die prematurely. Roots are few or lacking. Eventually the bulbs are partially or entirely decayed with a soft, chocolate or reddish-brown rot which usually starts at the base of the bulb. A white or pinkish mold often develops between the scales and on the base. Severely diseased bulbs eventually dry into mummies. (The disease is caused by *Fusarium oxysporum* f. *narcissi*. This form is distinct from the ones causing basal rots of tulips and iris.)

Symptoms that may be confused with basal rot can be caused by overheating, freezing, or an overdose of methyl bromide when the bulbs are prepared for marketing. Overheating results in a brown decay beginning first at the root initials and flower bud. In contrast, after freezing injury, tissues other than roots and flower buds are the first to become discolored. An overdose of methyl bromide produces a grayish-brown breakdown, which progresses rather uniformly from the outer surface inward and along junctions of slabs and flower stems.

Infection in the soil by the basal rot fungus usually starts in the roots and progresses into the basal plate and scales. Infection usually occurs late in the growing season, especially when warm (65-75° F.) temperatures and abundant soil moisture coincide. This combination often occurs in the eastern United States but is less common in the cooler Pacific Northwest. Infection may also occur during digging, cleaning, and grading when healthy and diseased bulbs are mingled.

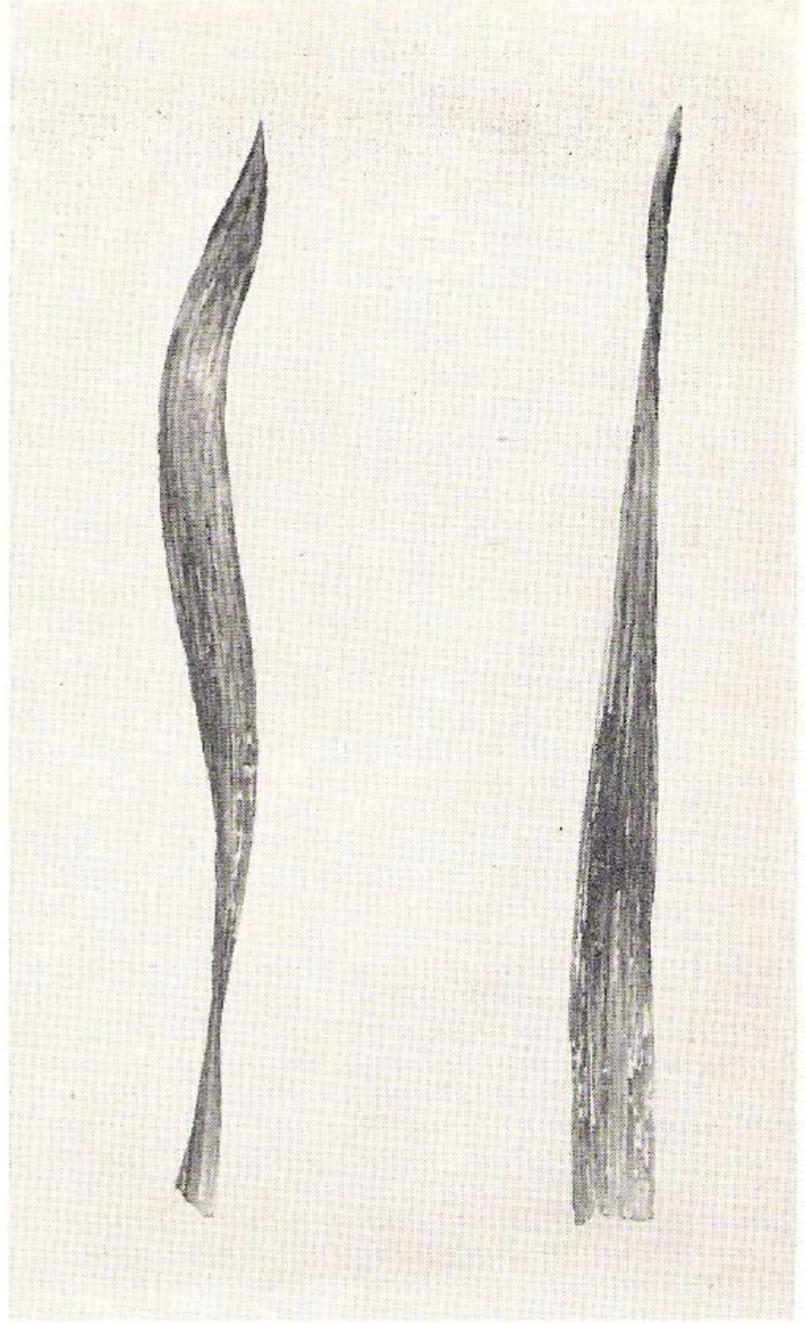
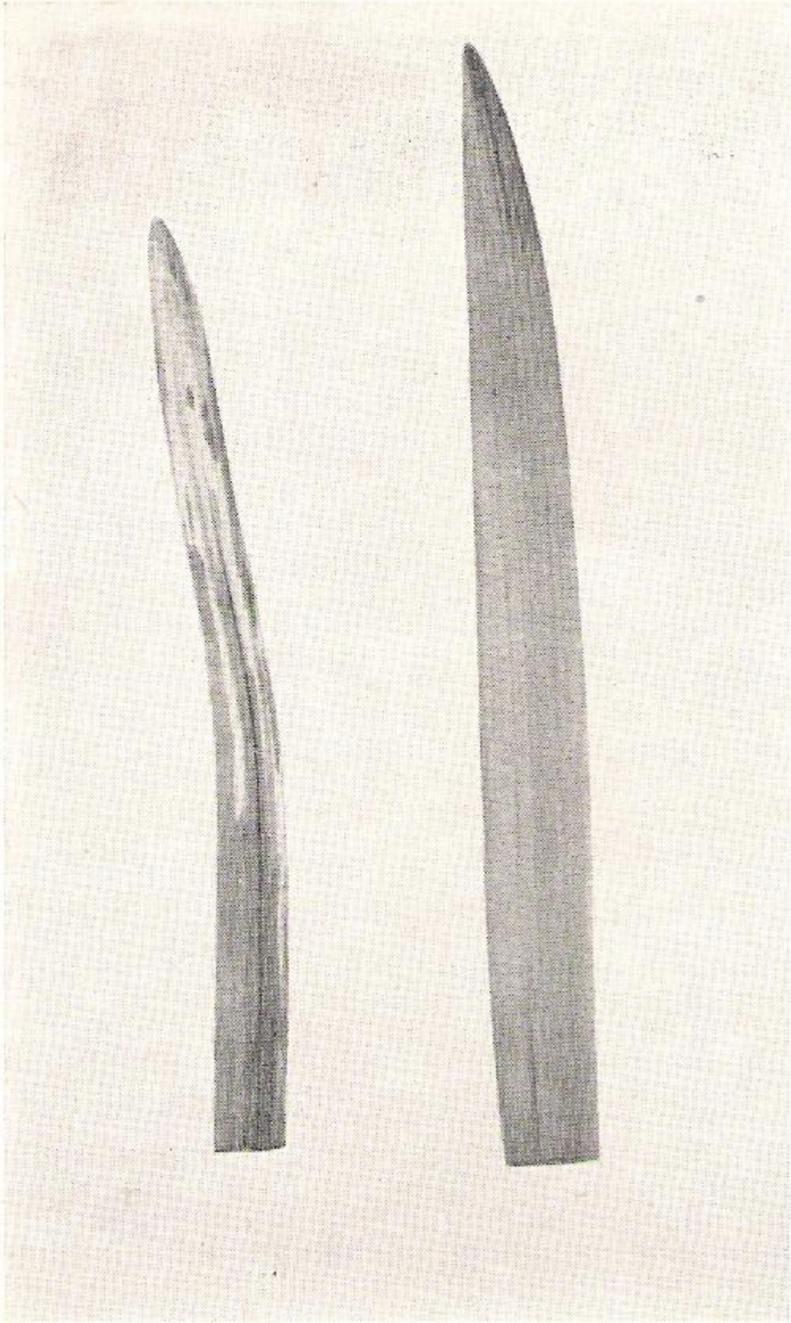


PLATE 44 C. J. GOULD
YELLOW STRIPE OR MOSAIC VIRUS

PLATE 45 C. J. GOULD
SILVER OR WHITE STREAK VIRUS

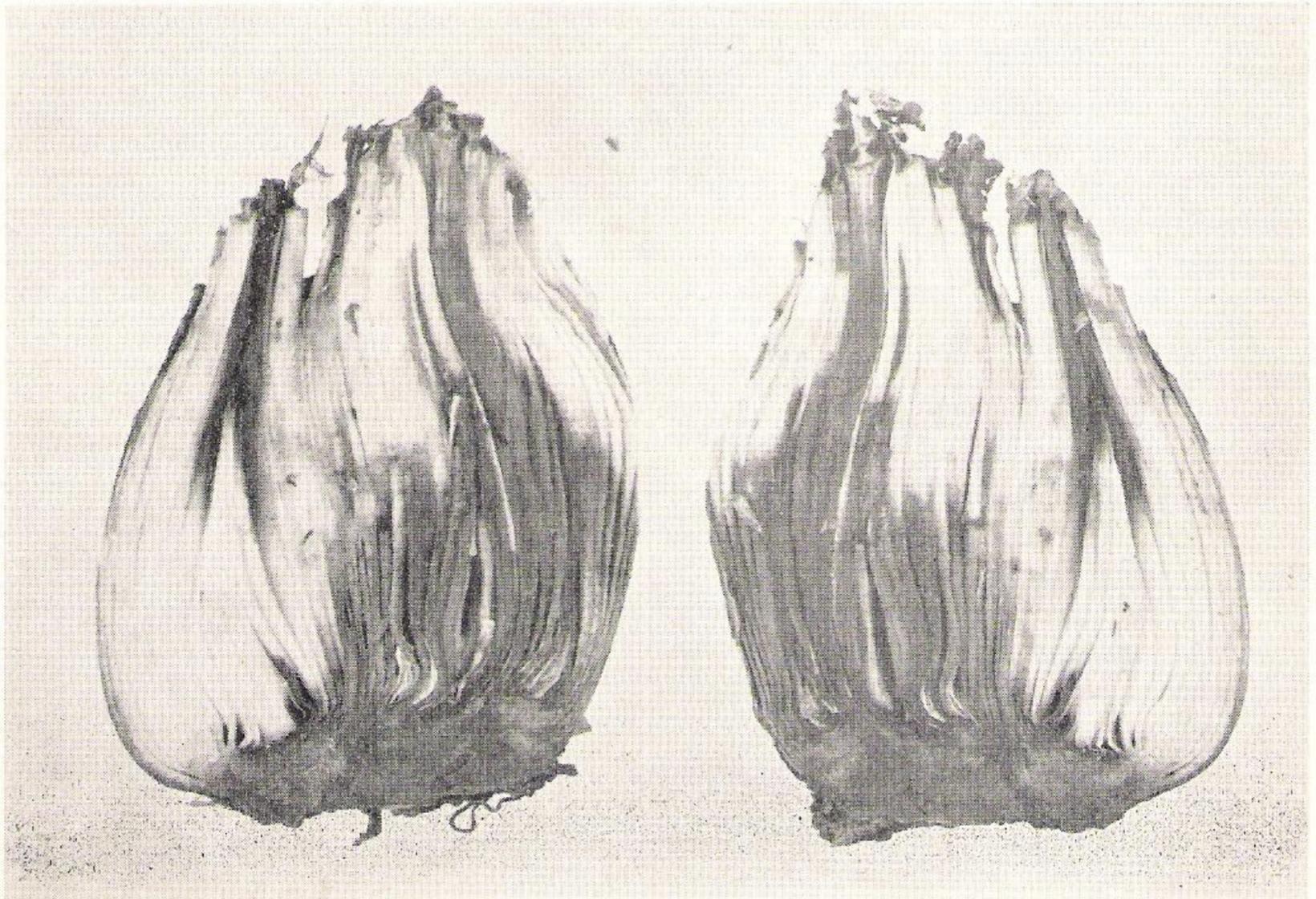


PLATE 46
BASAL ROT

C. J. GOULD

Infection during storage usually starts at the base of the bulb but occasionally elsewhere, particularly at wounds, bruises, sun-scalded areas, etc. As the bulbs mature in storage they become increasingly resistant to infection, but as soon as root activity begins they again become susceptible.

CONTROLLING BASAL ROT IN THE GARDEN

Proper culture is essential for the control of this disease. Dig bulbs as early as practicable and in cool, dry weather. Dry rapidly with good air circulation. Avoid sunburning, bruising, or otherwise injuring the bulbs. Diseased bulbs cannot be cured, so discard them as soon as found to avoid contaminating others. Store clean bulbs under cool (55-60°), dry, well-ventilated conditions. Change locations at least every other year, if possible.

In addition to proper cultural handling, a dip in a fungicidal solution is frequently desirable, but it is only recently that suitable types have become available in packages small enough to be practical for the average hobbyist. Dip bulbs for 10 or 15 minutes in a fungicidal solution at room temperature about 5 to 7 days after digging. Phenylmercury acetate (PMA) has been the fungicide most used in the United States in recent years. The standard rate is one level teaspoon (of the 98% powdered type) in 3 gallons of water (3.2 oz. in 100 gal.). First, make a paste of the wettable powder with hot water before mixing with remaining water. Since it is rather difficult to dissolve powdered PMA, some growers prefer to use liquid formulations. The 10% liquid type of PMA should be used at 3 liquid oz. in 10 gallons of water. Dirt "ties up" mercury compounds. Therefore, fresh solutions should be made up after dipping 4 lots of bulbs if they are clean, or after 2 lots if they are dirty. Plastic buckets or similar containers should be used since mercury reacts with most metals.

Although PMA has been the standard treatment, we have been continually looking for better fungicides. For example, during the 1964-65 growing season

we compared PMA with two other mercurials (Elcide, containing sodium ethylmercury thiosalicylate, and Morsodren, containing methylmercury dicyandiamide). Each of the fungicides was used on the varieties Rembrandt and King Alfred at two rates in three different schedules of application (one week after digging, just before planting, or both times). Similar tests were also run to control basal rots of tulips and bulbous iris.

Disease control and phytotoxicity varied with the varieties, the fungicides, and the rates of application. Elcide produced the most healthy daffodil bulbs, followed by Morsodren and PMA. Elcide was best on Rembrandt at the low rate of 2.4 fluid oz. in 10 gallons of water and on King Alfred at the high rate of 3.2 oz. in 10 gallons of water. Similarly, Morsodren gave better results on Rembrandt at a low rate of 3 fluid oz. in 10 gallons and on King Alfred at a high one of 6 fluid oz. in 10 gallons. PMA was best on both varieties at a high rate, namely, .6 fluid oz. in 10 gallons of water as against .3 fluid oz.

Although Elcide and Morsodren produced the most healthy bulbs, they also caused a great deal of flower injury on bulbs dipped a week after digging, especially at the higher concentrations. Much less injury was found on bulbs treated just before planting, but this late treatment gave almost no control of basal rot. On the other hand, PMA only slightly injured a very few flowers. Therefore it appears that Elcide, and perhaps Morsodren, may prove to be useful in treating severely diseased stocks (above 2% loss) where injury to the flowers is of little concern. PMA is adequate for treating less severely diseased stock and is less likely to cause flower injury. All three chemicals provided the best disease control when applied soon after digging, and there was no apparent advantage in these experiments in making a second application just before planting.

Among the many variables, affecting the degree of fungicidal injury to bulbs are: variety of daffodil, maturity of bulb, type and rate of fungicide, length and

temperature of dip, and rapidity of drying after treating. Bulbs raised in warm climates are usually not as succulent when dug as are those produced in cool climates and are, consequently, less apt to be injured. Mercury fungicides continue to penetrate into bulbs with prolonged dipping. Our results on iris bulbs in 1963 showed that a 15-minute dip in Elcide was much safer than a 60-minute dip. Drying bulbs rapidly after treatment will also lessen the possibility of fungicidal injury and decrease the opportunity for Blue Mold to develop.

Wear rubber gloves when using mercury fungicides and follow all other directions by the manufacturer for handling. If an insecticide is added, use the emulsifiable type since the ingredients are less apt to inactivate the mercury. If bulb containers (boxes, etc.) are to be re-used, treat them with one of the above fungicidal solutions or with formaldehyde (USP type) at 1 qt. in 5 gal. of water.

Treated bulbs should be dried rapidly and stored in a cool, dry location until planted. Plant in cool, well-drained soil and as deep as practicable to avoid warm temperatures. When fertilizing, remember that excessive nitrogen and phosphorus increase losses from basal rot, while high potassium helps reduce them. Either avoid organic fertilizers or mix them thoroughly with the soil early enough to permit decomposition before planting.

Do not replant on the same land more often than once every two years in cool areas such as the Pacific Northwest and less often in warmer regions. If this cannot be done, replace the soil periodically. Treating soil to eliminate the *Fusarium* has not yet proven to be practicable because the fungus is usually re-introduced in or on infested bulbs. Some soil treatments have even increased losses, apparently because they eliminated beneficial (antagonistic) fungi. If soil treatment becomes essential, contact a custom applicator of pesticides or your local county agent.

OTHER SOIL-BORNE ROTS

A few other fungi will occasionally rot bulbs in the soil. Probably the most

common of these is the Southern Blight or Crown Rot fungus (*Sclerotium rolfsii*). This fungus appears as white threads; a white mat; or small (1/16 - 3/16 in.), rounded, reddish-brown, pock-marked bodies (sclerotia) on or between the scales. An odor typical of rotting wood accompanies this fungus. Although daffodils are not often seriously injured, infected bulbs may carry the fungus into areas subsequently planted to iris, tulips, or other plants which are much more susceptible. Fortunately, the Crown Rot fungus can be killed in bulbs by a hot water treatment (described elsewhere), and it is controlled in soil by dusting pentachloronitrobenzene (PCNB) over the bulbs and adjacent soil before covering. We use 2 1/3 lbs. of the 20% dust of PCNB per 100 sq. ft. on heavy or peat soil and 1 3/4 lbs. on lighter soils. (Residues of PCNB may persist in soil for long periods of time and research at Washington State University has shown that these residues can be absorbed by carrots planted a year following treatment at the aforementioned rates of application. Since a tolerance has not been established for PCNB in carrots, it is suggested that carrots not be planted in treated soils for at least two years following application.)

NEMATODES

Both the root lesion and bulb and stem nematodes may cause a stunting and disfiguring of leaves. Their identification is discussed at length in Chapter 7, so only a few comments will be made here. Daffodils are not often seriously damaged by the root lesion nematode alone. Most damage occurs from certain soil-inhabiting fungi which invade through the nematode-produced wounds and proceed to rot the roots. Experiments by Apt and Gould in western Washington several years ago showed that soil fumigation with dichlorpropene controlled the nematode. This treatment has been successfully used by commercial growers in the few fields where the root lesion nematode was a problem. Chloropicrin and methyl bromide also controlled the nematode in the above

tests, but basal rot losses were increased, perhaps because the numbers of beneficial (antagonistic) organisms were reduced. Another possibility for the hobbyist is to try growing African marigolds in infested soil. Research in Holland has shown that these plants reduce nematode populations.

The only effective cure for the bulb and stem nematode is a treatment in hot water plus formalin. The hot water plus formalin treatment has many advantages for the hobbyist or hybridizer and justifies more widespread use now that small treating tanks are generally available. In addition to killing nematodes, the treatment also destroys most parasitic fungi, the destructive *Tarsonemus* mite, and other insects. Unfortunately, it doesn't eliminate the basal rot fungus, but the formaldehyde prevents spread of the fungus to healthy bulbs during treatment. Hot water-treated bulbs should be cooled and dried promptly to decrease injury and the opportunity for Blue Mold to develop.

Commercial growers in western Washington have found the hot water treatment so beneficial that they now regularly treat all their bulbs on a rotation basis every third year, whether the nematode has been found or not. Large tanks have been specially constructed for this purpose in order to treat as many as 10 tons of bulbs at a time.

LEAF SPOTTING

Fungus leaf spots are rather common but not usually serious under proper cultural conditions unless bulbs are left too long in the same location. Then the losses increase yearly. Scorch (caused by *Stagonospora curtisii*) is probably the most destructive disease, particularly in warm, humid regions such as the Southeast. The spots, which vary in length, are narrow, brown, and rough.

White Mold (*Ramularia vallisumbrosae*) begins with brown spots which later become covered by a white mold. This disease also occurs under warm, humid conditions.

In cool, moist areas such as the Pacific Northwest, species of *Botrytis* are more often the cause of trouble. This

disease is characterized by large brown spots which are sometimes covered with a light gray or grayish-brown fuzz. The most common pathogen is *B. narcissicola* which causes the disease called Smoulder. Another one commonly called Fire (*B. polyblastis*) is less common but may be destructive under moist conditions at temperatures above 50° F. The latter fungus and another *Botrytis* (*B. cinerea*) also spot and rot flowers.

All these fungi may survive in dead leaves and most of them can also be carried on the bulbs. Fortunately, the controls for the common leaf spots are similar. Bulbs should be dug, cleaned, and replanted in a new and well-aerated location at least every two or three years since parasitic fungi continue to increase the longer bulbs remain in the same place. Diseased leaves and/or plants should be removed as soon as observed. All debris (old flowers, leaves, scales, etc.) should be put in the garbage can and not in the compost pile. These precautions are usually all that are necessary. However, in gardens where leaf spots occur every year, fungicides must be used. Two sprays are usually sufficient in the Northwest—once when the plants are about 6 in. high and another as soon as the blooms are removed. Under more severe conditions spraying should be repeated every two weeks, beginning as soon as the disease appears (or before, if approximate dates are known from previous experience). Copper compounds, particularly homemade Bordeaux mixture in proportions of 8-12-100, have been most frequently used and are still considered very reliable. However, they sometimes cause injury, especially if the weather is hot or if too much wetting-sticking agent is added. If such injury occurs, the grower should try reducing the amount of wetting agent, or fungicide, or both.

Zineb, one of the newer fungicides, has been found very promising in experiments in England and by growers' tests in the United States. Although it doesn't control the leaf spot fungi quite as well as does Bordeaux mixture, zineb is less apt to burn the leaves. The usual rate is 7 level tablespoons (1 oz.) of

zineb in 3 gallons of water. Control will be improved by adding a wetting-sticking agent according to directions on the package.

VIRUS DISEASES

Only two viruses should concern the daffodil hobbyist, although the commercial grower must consider several more. The two most common and occasionally serious are Silver Streak (or White Streak) and Yellow Stripe (usually called "Gray" in Holland and "Mosaic" in the United States). The name "Stripe" has recently been adopted for international usage. As soon as the leaves emerge Stripe can be seen as light green to yellow streaks or mottlings accompanied by a roughening of the epidermis of the leaves. (The hot water treatment may also cause a mottling of the tips of the leaves, but not a roughening.) Stripe-infected flowers are often disfigured with pale-colored streaks.

The Silver Streak disease symptoms appear after flowering as narrow, white, yellowish-white, or gray streaks. High temperatures stimulate development of the White Streak symptoms.

Virus-diseased plants cannot be cured. Therefore, commercial growers establish foundation blocks that are carefully rogued to eliminate the virus-infected plants. These plants are examined for Stripe early in the spring and later for White Streak. The most practical controls for the hobbyist of these diseases are: (1) only buy bulbs from reputable sources; and (2) dig and destroy infected plants as soon as detected. Commercial growers customarily use insecticides since many of the daffodil viruses are spread by aphids. However, the value of disease control by insecticides in small plantings is debatable, because aphids move frequently. It has also been suggested that hybridizers enclose their seedlings in aphid-proof enclosures.

Another virus disease (Chocolate, or Brown, Spot) is also common but seldom destructive. The brown to purple spots or streaks appear late in the season and are usually confined to the upper parts of the leaves. A *Phyllosticta* fungus

also causes brown spots, but this disease is not as common as the virus disease. The intensity of the Chocolate virus symptoms varies from year to year. Although the spots are unsightly, neither the flowers nor bulbs are seriously affected. Nevertheless, severely-infected plants should be eliminated to keep the stock in as good condition as possible.

Additional viruses sometimes found in daffodils include Rattle, Mild Mosaic, Onion Yellow Dwarf, and Cucumber Mosaic. These may cause problems for commercial growers but are rarely of concern to the hobbyist or homeowner.

Some hobbyists are afraid of spreading viruses by picking flowers. This probably seldom occurs, but may happen with certain viruses. It has been shown elsewhere with other types of viruses that trisodium phosphate was more effective than soap for inactivating virus on hands. Dr. Frank P. McWhorter of Oregon State University states that fortunately there is no danger of mechanically transferring the common daffodil viruses.

STORAGE ROTS

Storage rots should not be a problem if sound bulbs are stored continuously under cool, dry conditions until planted. However, conditions are seldom perfect. The most common storage problem is basal rot, which has already been described.

Blue Mold (caused by species of *Penicillium* similar to those on oranges and apples) is a common but weak parasite that usually attacks only the outer scales. Blue Mold develops under cool, moist conditions and most often on bulbs that have not been dried rapidly enough after being treated in mercury solutions or in hot water, or that have been bruised, sunburned, or otherwise injured. The mold may also appear when bulbs are being precooled (preparatory to greenhouse forcing) if the humidity is too high. Control is simple: keep the relative humidity low (below 70% is probably sufficient) and avoid bruising, sunburning, or otherwise injuring the bulbs. Most of the common fungicides

used on bulbs are ineffective against Blue Mold.

The ordinary Black Bread Mold (*Rhizopus stolonifer*) occasionally causes a decay in storage. Affected bulbs develop a wet, soggy rot. The basal plate appears dark and the scales dull, grayish brown. The surface may be covered with a coarse gray mold and intermingled black specks (fruiting bodies of the fungus). This disease develops primarily on overheated bulbs or those that have mechanical or sunburn injuries and are stored at high temperatures with poor ventilation. It is prevented by: 1) avoiding injury, 2) keeping bulbs cool and well ventilated during storage and shipment, and 3) drying and cooling bulbs rapidly after the hot water treatment.

A FINAL WORD

Do not become alarmed at the number of diseases discussed herein. The hobbyist should seldom encounter more than two or three as serious problems. In general, he should have very little trouble if he will only: buy his bulbs from a reliable source; plant in a well-aerated and well-drained soil without excessive amounts of nitrogen, phosphorus, or organic matter; promptly remove infected plants if virus symptoms appear; spray as soon as any leaf or flower disease develops; remove flowers promptly after blooming; dig and replant in a new location at least every other year. These simple procedures will permit daffodils to be a joy instead of a burden.

Precautions

Insecticides and fungicides can be poisonous to humans and to other animals but in varying degrees. Although those here recommended for the home gardener are relatively nonpoisonous to humans and other animals, nevertheless even they should be handled with respect and used only in accordance with the directions and precautions stated on the label of the container and those stated herein. Use only chemicals recommended for home gardens. Apply an insecticide or fungicide only to a pest or disease for which the insecticide or fungicide is recommended, and do not overdose. Mix sprays in open air and work on the windward side of the area being treated. Avoid repeated or prolonged inhalation of an insecticide or fungicide; keep it away from eyes, nose, and mouth. Wash all exposed skin with soap and water after using the insecticide or fungicide; and change clothing if you spill any of the material on it. Label all insecticides and fungicides clearly and store in closed containers in a safe place, out of reach of children and pets.

—9— Daffodils in the Home Setting

Few flowers are as versatile as daffodils. They may be planted almost anywhere in the home garden, but some places are better than others. Their beauty is not enhanced by lining them up like tin soldiers or plunking them out in the middle of a lawn. Daffodils need to be planted in depth for their grace to be effective. They need to have a background—a fence, a stone wall, a hedge, evergreen or deciduous trees, or shrubs. Daffodils are not aloof and regal. They are sociable flowers whose loveliness is intensified by suitable companions.

Daffodils need a background for functional as well as aesthetic reasons. Since they face in the direction of the greatest light, a background will encourage them to look toward you. Nothing is more demoralizing than to have a border of daffodils facing toward the neighbors. Neighborliness can go too far! It is well then to give some thought to the relation of light in the planting of daffodils.

Early varieties ought to be planted where one can see them while coming and going. It is human nature to want to stay close to home in cold, wet, and windy weather, and Spring may bring more than a few such days. Even hardy gardeners do not like to compact the soil by walking on a soggy lawn.

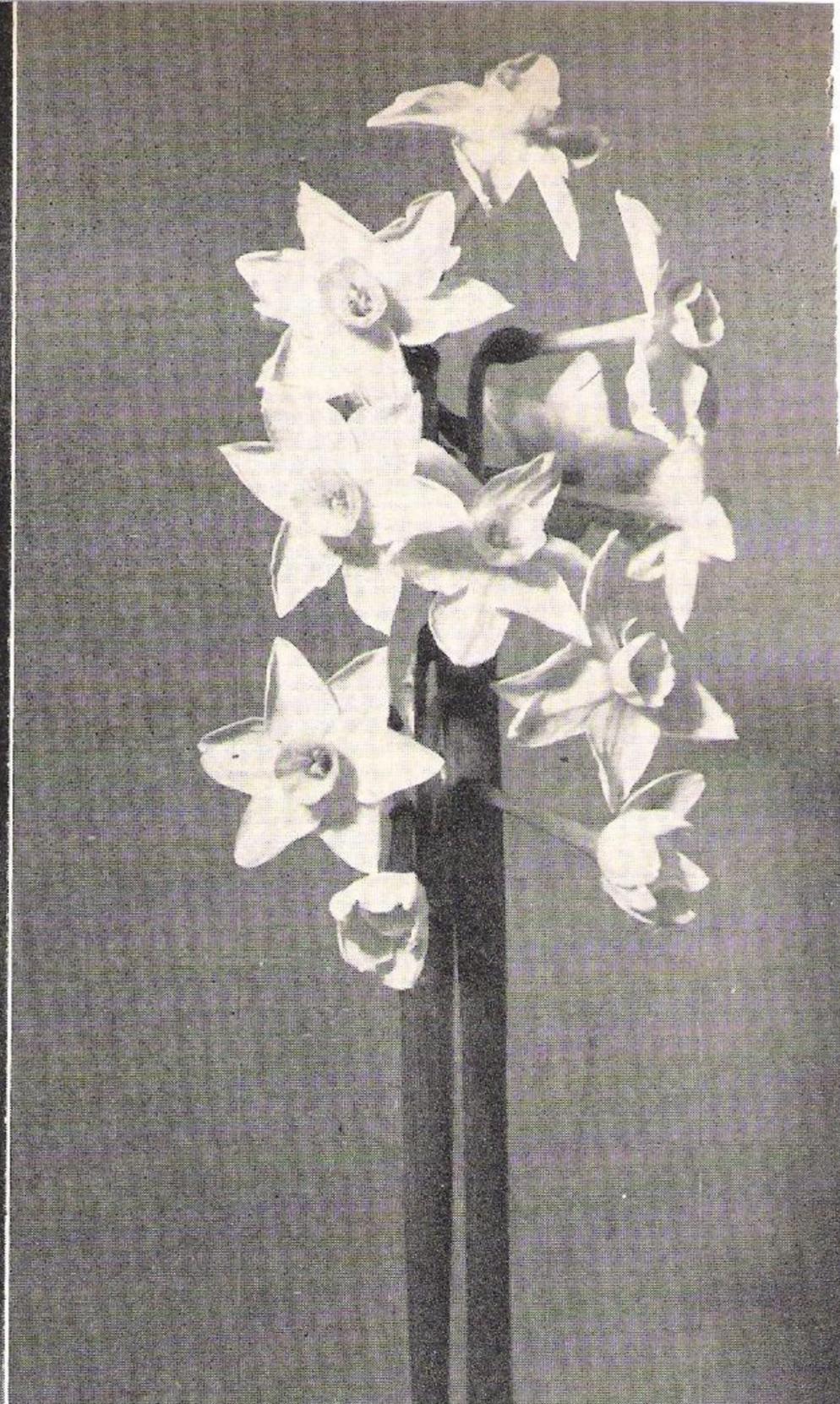
N. asturiensis (*N. minimus* of the trade) begins the season here. This lilliputian trumpet enjoys a corner near the doorway. It really needs to be planted on a raised plot and in quantity. *Asturiensis* blooms with the Winter Aconite (*Eranthis hyemalis*), *Crocus chrysanthus* varieties Warley White, Blue Giant, E. P. Bowles, Moonlight, and Snow Bunting and just in time for *Iris reticulata*. *Scilla siberica* Spring Beauty

joins in soon. *N. minor conspicuus* (*N. lobularis*) and Bambi are very early, too.

February Gold follows closely on the heels of *asturiensis*. Visitors at the front door like to be welcomed by this jaunty fellow with the rabbit-like ears. As its clumps thicken, its bloom increases. February Silver comes a bit later and enjoys a long stay. Doorway plantings satisfy one's hunger for beauty after a long winter. They allow one to appreciate the courage and stamina of the first arrivals. Foresight is another "nearby" daffodil. It is white with a lemon cup and has the intelligence to appear when it is most needed. Its stems are short; its bloom prolific. Plant it alongside a drift of *Crocus* 'Purpurea Grandiflora.'

Daffodil plantings that can be viewed from a path in wet weather are very gratifying. The best paths are made by deer and children. A path ought to be firm and definite and, of course, it ought to lead somewhere and circle back from whence it came. Pine needles or leaves make good paths. Fortune, with its bold yellow and orange cups is an early daffodil that looks commanding planted in a long drift among trees not far from a path. Planted where one can see it from the kitchen window, it performs an heroic role. Always very early and very dependable, Fortune appreciates a groundcover. The blue flowers of *Vinca minor* will smile at their good Fortune. Many other early daffodils are listed in Chapter 13.

Slopes provide ideal drainage and perfect viewing for the daffodil. They are ideal for slightly pendant bloomers and Charity May is such a daffodil. It is so bright, so prolific, and so graceful that it stirs one's heart to see it arrive



year after year. Remember, too, daffodils and rocks are like peaches and cream. Rocks act as warmers and protectors in early spring. They retain the heat of the sun and their invincible surfaces shield the flowers from the elements. Try the underrated Parkmore with its strong stem and fine form, or Peeping Tom, a big and bold golden flower that says "Come look at me." These daffodils are complemented by *Muscari* Heavenly Blue.

Any garden with daffodils needs some deciduous trees and shrubs to break the force of the rain and wind and to temper the effects of the heat and cold. The daffodil is not a prairie flower. Perhaps this is as good a time as any to mention that daffodils not grown in grass ought to be groundcovered or mulched for obvious horticultural reasons. Splattered daffodils are not objects of great beauty. *Arabis alpina* makes an excellent spreading groundcover. Its gray-green indented foliage and airy mass of white flowers lighten the solidity of the daffodil. *Cyclamen neapolitanum* with its green ivy-shaped leaves makes a delightful neighbor. *Phlox divaricata*, the wild blue phlox, takes one's breath away as a nearby underplanting of the white *triandrus* Tresamble, especially with *clusiana* tulips chiming in. *Chionodoxa luciliae* asserts its tiny blue voice anywhere and everywhere. *Hepatica* is an early wildflower whose heart-shaped leaves enhance the daffodil. Later Bloodroot (*Sanguinaria canadensis*) with its broad leaves and glistening white blooms lends its impressive presence. The finely cut foliage of the Winter Aconite stays around for the daffodil season. The fresh green of the leaves of Sweet William (*Dianthus barbatus*) has a groundcover effect long before it blooms.

Daffodils with fragrance ought to be planted close to the natural paths of home life. You will find most of the fragrant daffodils in Divs. 7, 8, and 9—the jonquils, tazettas, and poets. The first scented daffodil to bloom in my garden is Sweetness, a clear gold jonquil of unmatched perfection of form. Plant it along the beginning of a path or at the forefront of a patio border where its fragrance will drift toward you and engulf your senses. Or perhaps near a bird feeder that you visit to refill. Skylon is another of my fragrant flowers. Bebop and La Belle are delightful, sweet-smelling miniature jonquils. The tazetta family provides its share of fragrance and Canarybird is one for which I have a special fondness. The reliable Geranium is heavily scented, while the double Cheerfulness and its yellow sister which are sports of the *tazetta* Elvira perk up the olfactory senses.

Daffodils planted near a bird feeder or birdbath are accented by the busy activity of the scarlet of the cardinal, the black and white of the chickadee, the blue and white of the jay, the gray and brushed orange of the titmouse, the brown of the thrasher, the purple of the grackle, and the darting blue of the bluebird. Their changing colors provide an evermoving setting for the daffodils. One word of caution—do not plant directly under a bird feeder, or the flowers will get rough treatment, not only from birds that are ground feeders, but also from squirrels and chipmunks.

A bit away from the house there may be a few large trees with which daffodils would associate happily. March Sunshine is unspectacular as a single bloom, but its grace cannot be surpassed in clumps among trees. Binkie, a citron-yellow, midseason flower, shines forth like cool sunlight against the dark green of hemlocks. It is a pearl of great value. Thalia is fine in a woodland and has a grace which its show sisters lack. Actaea is another tried and true woodland favorite. Trevithian, the jonquil with a sweet odor and reedy foliage, adds a different note, but give it a sunnier and damper spot. Leeuwenhorst, unpreten-

TAZETTA HYBRIDS

Matador (upper left), White Pearl (upper right), Scilly White (lower left), Mrs. Alfred Pearson (lower right)—All Div. 8.

tious as a single bloom, conveys a lovely massed effect and gets better every year. White pines make impressive backgrounds for daffodils in open sunny areas.

Of course daffodils may be planted in borders. A border to be pleasant visually needs to curve gently and have some ups and downs. Nothing is less exciting than a flat piece of ground planted with squares of daffodils. It may make an excellent exhibition bed but a dreary garden border. The border ought to be deep enough to lend the beauty of perspective to the planting. Shrubs and small trees here and there within a long border add background and solidity.

Daffodils in the border should be in groups of 3 to 25 of each variety with each group clearly separated from other groups. The best effect is created by planting in bays among the shrubbery or on curves or around corners where the effect of a large number of clumps is not seen at one glance. Most gardeners, however, after their first success are anxious to add new varieties and so the clumps crowd closer and closer together. So it should be remembered that daffodils are for garden decoration and not a garden in themselves.

Euonymus alatus compactus (Burning Bush) adds charm and strength to any border but needs room to spread its wings. Pink or red quince is pleasing with white daffodils. Try Cantatrice or Tain or Courage for a striking effect. White and yellow daffodils, like Festivity or Preamble, look well backed by the

gold of forsythia. Tall and bold fellows, like Statue or Foxhunter, look commanding at the back of the border. Ceylon or Ormeau are good middle border flowers. Smaller daffodils, like Le Beau, Jenny, The Knave, Nor-Nor, Dove Wings, or the irrepressible Beryl are best in the forefront.

There is no lack of companions for the daffodil in the border. Hyacinth Delft Blue adds a blue note to early bloomers, and the more staid Grand Maitre with its deep blue bells comes along later. Include *Leucojum*, the nodding Snowflakes tipped green. Bellona is a heavy-textured and fragrant single early tulip that comes with Tresamble and Geranium. Late daffodils, such as Cushendall, Reprieve and Shagreen, bloom happily with the nodding blue bells of the Wood Hyacinth (*Scilla campanulata* Myosotis). The polyanthus primula with their cream yellows, copper reds, and medium blues add interest to the foreground of the border while the fronds of the Maidenhair Fern are beginning to unfurl. The bells of checkered *Fritillaria*, Virginia Bluebells (*Mertensia*), and the cyclamen-like white flowers of Shooting Star (*Dodecatheon meadia*) all add a gay note to the border. The awakening foliage of Columbine (*Aquilegia*) and Bleeding-heart (*Dicentra spectabilis*) contrasts with the heavy foliage of the daffodil. *Thalictrum dioicum*, the Early Meadow-rue, has equally lacy foliage. One could go on and on, for you see there is no end to the friends that come and go with the daffodil.

—10— Natural Plantings

A good deal has been written about "naturalized" daffodils, but if we are to respect the true meaning of the word, a naturalized planting would be one which is self-perpetuating without later improvement of the growing conditions. Culture is incompatible with a naturalized state. There are few plantings of daffodils in this country which are entirely on their own and therefore truly naturalized. The best example would be those—mostly tazettas and jonquils—which glorify the roadsides, hedgerows, orchards, and fields of the deep South. These survive not only complete neglect, but trampling, mowing, and plowing.

In the wild, the species of daffodils and the occasional natural hybrid grow in many settings: thin woodlands or openings in the forest; on barren mountainsides among tumbled rocks; in fields or marshy meadows; in the shallow pockets of soil on narrow ledges of rock faces; or in the crevices of moss-covered, dripping limestone cliffs.

Most gardeners are denied such sites and when horticultural writers observe that daffodils are charming when "naturalized," they usually have in mind only bulbs scattered in a lawn, field, under a tree, or at the edge of some suburban woods that have escaped the bulldozer. How permanent such plantings prove to be will depend on the varieties set out, the competition of other plants, and the length of time the power mower is immobilized. These compositions are at best natural or informal plantings, not naturalized daffodils.

Whatever the appropriate term, there is no question that daffodils are a home-spun flower; ill at ease in formal beds or geometrical patterns; better in clumps or associated with other plants around the house or in the border; best of all

along woodland paths, among native trees, and in drifts through fields or rough grass. Because of the need to let the foliage ripen, a process which may not cease before July, daffodils are not a suitable plant for a lawn. Wordsworth's "dancing daffodils" have no place in a carefully trimmed, thick carpet of the best lawn grasses which is the goal, if not the achievement, of most homeowners. "Daffodils in sod" is a phrase often encountered and means below a sod or turf composed not only of grasses, but of any small herbaceous plants—weeds, if you will—the sort of terrain which on a golf course is known as "the rough."

The rules and practices for growing daffodils in uncultivated ground are a bit different and more flexible. The result is less work and expense, but great satisfaction if one is content to take his reward in the massed effect of everyday flowers, rather than the perfection of individual specimens of exhibition quality.

The three rules for an attractive natural planting are 1) each grouping should consist of a single variety, 2) the planting should be irregular in shape, and 3) groupings which are visible from a vantage point should flower about the same time.

Naturalizing mixtures may help a dealer dispose of discarded varieties and nameless bulbs, but the garden effect of these offerings is disastrous. Unity is lost in the sequence of flowering, the different heights create a jagged profile, the smaller plants are obscured by their fellows, and there is an irritating clash of textures and colors.

Numerous suggestions have been made as to the shape a group should take. The precise shape is a minor matter and may be determined to some extent by the contour of the land and by trees and other natural features, but as a

general rule it should be an irregular oval with the length about three times the width and the length at right angles to the viewer. In planting, the shape may be outlined by stakes, a garden hose, clothesline, or fallen branches.

The bulbs should thin out from a denser planting near, but not at, the center, simulating slow development of the group from an original single bulb. In the case of a large layout, this impression can be furthered by two or three small, sparse clumps adjacent to the principal grouping. In the denser part of the figure, spacing may be as little as 12 inches, increasing to 18 inches toward the perimeter.

The exact spotting of the bulbs can be left to chance or carefully planned. Tossing handfuls of the bulbs around and planting them where they fall is widely recommended by armchair gardeners and certainly demands a minimum of effort, but a studied arrangement is more likely to create the desired natural effect. There is also considerable evidence that women are better at arrangements than they are at tossing balls or bulbs. If the surface vegetation is thin, the bulbs may be laid by hand on the surface and the effect carefully considered before planting. If greater visibility is needed, white pot labels or other conspicuous markers may serve as stand-ins for the bulbs.

It is difficult to create an attractive effect with less than 50 bulbs and a hundred or more would be better. The number of groups and their individual size will depend entirely on the area to be planted, but a few large groups are more effective than numerous small ones.

The method of planting will have to consider the soil and density of the turf. Ideally, the turf should be lifted and the soil beneath prepared as it would be for any other garden bed, but few will go to that trouble. There may even be reasons why it would be unwise to be so thorough, such as damage to tree roots.

Bulb planters, operated either by hand or foot, are satisfactory if they will penetrate the turf and bring up a solid cylinder of soil from a depth of 6 inches

or more. This would place a minimum of 4 inches of soil over the bulb. Deep planting is desirable to retard the natural increase of bulbs and to maintain the flowering for many years. A small amount of sand or soil mixed with bonemeal should be placed in the bottom to insure that the bulb rests on firm, rich soil and not on an air pocket. A crowbar may be used, but requires soil to fill the hole, and the danger of an air pocket is greater. A pickaxe or grapehoe will bring up a wedge of soil which can be replaced after the bulb is set, again on a pad of sand and bonemeal. A spade will serve the same purpose and a wide spade may provide spots for two bulbs. Whatever tool is used, it will work easier in a soft, damp soil and planting may usually be deferred until conditions are favorable.

From one-third to one-half of the entire area should be left unplanted and there should be sufficient space around each figure to give it, and the variety which forms it, identity. Above all, irregularity and informality should be observed: irregularity in shape, in size, and in spacing; both of bulbs within a group and between the several groups themselves.

Most home gardeners should realize that they do not have a suitable site nor sufficient space to indulge in a simulated natural planting. This type of gardening should be left to parks, botanical gardens, large estates, and homeowners with at least a quarter of an acre of ground apart from the usual lawns, borders, and kitchen garden.

Those with sufficient space must first consider its suitability. Full sun or light shade is best for bulbs which are expected to thrive on neglect. A thin soil overlying rocks should be put to other use, and land which is badly drained will not appeal to daffodils. A stiff soil or a thick sod will dull the enthusiasm of most gardeners in proportion to the quantity of bulbs to be set out. On the other hand, a deep, moist loam beneath a thin sod can easily be worked; a backdrop of trees or a slope running down to a pond or stream would be a bonus, indeed. A boulder-

strewn hillside—the steeper the better—can be utilized if the planting is confined to existing or constructed pockets of soil in the shadow of the boulders. Here the species and smaller varieties can be shown to advantage.

The selection of varieties (or species) for natural plantings must consider not only performance of individual varieties under indifferent conditions, but also the availability of the more desirable varieties. As a general rule, the older and less expensive varieties have the vigor which enables them to persist and flower in sod for years, whereas the more highly bred introductions of recent years may run down rapidly. But because they are old and inexpensive, many of the better varieties for natural planting in quantity have been dropped from dealers' lists.

A gardener is fortunate if he can get starts of older varieties from a long-established planting. A clump or two of one of these oldtimers which has been down for many years will yield an amazing number of bulbs. Or a natural planting may be built up by transferring to it, on a trial-and-error basis, the surplus increase from one's own garden. In the South, the Farm Market Bulletins offer an easy and inexpensive source of tazettas and jonquils which are as uncertain of name as they are certain to thrive.

The huge trumpets and large cups seen in gardens are unknown in the wild and seem somewhat out of place in a planting which attempts to mirror Nature. Size is not a virtue in such a setting and, in general, the larger varieties in Divs. 1 and 2 should be passed over, or at least not made neighbors of the daintier jonquilla, poeticus, cyclamineus, and triandrus hybrids. Difficulty may be anticipated with the trumpets and poets in the South and with the tazettas in the North. Doubles are uncertain performers, even under favorable conditions, and are not highly re-

garded for planting in turf, except, perhaps, the ubiquitous *Telamonius Plenus* and the older Phoenix group which are occasionally still found in rural gardens.

However, if bulbs must be purchased, a search of current catalogs will still yield a sufficient number of the older and cheaper named varieties which are likely to perform well. Some dealers, usually Dutch, quote prices per hundred of a variety (50 at half the 100 rate) and some American dealers offer a limited selection by the bushel or half-bushel. Varieties of proven performance which are still cataloged are:

- 1a. Cromarty, Emperor, Mulatto, Trumpet Major.
- 1b. Effective, Pres. Lebrun, Music Hall.
- 1c. Mrs. E. H. Krelage, Moray, Mt. Hood, Roxane.
- 2a. Carlton, Fortune, Helios, Porthilly, Rouge, Rustom Pasha, Trevisky, Yellow Poppy.
- 2b. Brunswick, Dick Wellband, Duke of Windsor, Folly, Franciscus Drake, John Evelyn, Mrs. R. O. Backhouse, Rubra, Tunis.
- 2c. Ludlow, White Nile.
- 2d. Binkie.
- 3a. Clackmar, Therm, Tredore.
- 3b. Angeline, Forfar, Kansas, Mystic.
- 3c. Distingué, Polar Ice.
4. Cheerfulness, *Telamonius Plenus*, Yellow Cheerfulness.
- 5a. Moonshine, Shot Silk, Stoke, Thalia, Tresamble.
- 5b. Frosty Morn.
- 6a. Bartley, February Gold, Golden Cycle, March Sunshine, Peeping Tom.
- 6b. Beryl.
- 7a. Fairy Nymph, Golden Goblet, Golden Sceptre, Sweetness, White Wedgwood.
- 7b. Chérie, Hesla, Lanarth, Nirvana, Orange Queen, Trevithian.
8. Aspasia, Cragford, Geranium, Laurens Koster, Orange Wonder.
9. Actaea, Dactyl, Milan.
10. \times *biflorus*, \times *gracilis*, *jonquilla*, *jonquilla minor*, *minor*, \times *odorus*, \times *odorus* 'Rugulosus,' *poeticus recurvus*, *psuedo-narcissus moschatus*, \times *tenuior*.
11. Split, Hillbilly's Sister.

—11—The Elusive Pink

Human nature being disposed to desire that which is difficult or impossible of attainment, it is perhaps quite natural that plant breeders are never content with the colors already present in any genus of flowers, and that they will bend every effort toward the developing and perfecting of shades and tints not present. As examples one may note the endeavors to produce a blue rose or gladiolus, a red iris or pansy, and a black tulip. Quite as intriguing is the quest for a pink daffodil.

Occasionally, nature in a capricious mood, produces a mutation with a new shade of coloring, suggesting a line of endeavor for the hybridist, and perhaps more frequently than otherwise, it is this that furnishes him with the incentive for the developing of a line previously not thought of, or considered beyond bounds. Being motivated with the desire to accentuate and further improve the new color, if he can bring his ideal to fruition, he not only gains the satisfaction of having accomplished a difficult task, but gardeners who grow his new plants benefit from his success.

The genus *Narcissus*, although possessed of many attributes which appeal to flower lovers, was quite limited in its color range. There are still many who think of all daffodils being yellow, and have some conception of "white narcissus." An awareness of orange or red in the coronas is less rare than it once was, but there are many to whom the thought of a "pink" daffodil is preposterous. Let it be admitted that hybridizers and fanciers take some license in naming colors of flowers! That which approaches or suggests a color is likely to be so designated. Be that as it may, the coloring in

the coronas of some of the best recent introductions in this class could hardly be described other than pink when at their best.

Just where and when pink coloring first made its appearance in daffodils is probably unknown, nor has the source been ascertained with certainty, but it is generally conceded that it developed through the use of some of the white trumpet species and the poets. The latter are also credited with being the progenitors of the orange- and red-cupped daffodils. This will not be an attempt to trace the origin nor give the history of the development of the pink daffodil in detail. That will of necessity be left to a competent research student with ability, time, and access to published materials in this field. However, one cannot ignore the background and some of the phases of their development and at the same time give any clue to the advancements that have been made.

In a somewhat technical paper*, Dr. Edgar Anderson and Earl Hornback wrote some years ago on the origin of pink coloring in daffodils and the genetical linkages involved. Among other conclusions reached then was that pink coloring was linked with narrow sepals (outer perianth segments). Nearly all varieties introduced up to that time would confirm that opinion. It was assumed that pink daffodils were recombinations of characteristics derived from *N. moschatus* (of Haworth) and *N. poeticus*, the former now known as *N. pseudo-narcissus alpestris*. As the yellow from some of the bicolors and orange red from the poets were involved in getting early "pinks," it may readily be

* *A Genetical Analysis of Pink Daffodils*. Edgar Anderson and Earl Hornback. Vol. VII, No. 1, Jan. 1946, Journal of the California Horticultural Society.

seen that the colors would tend to run more to salmon and apricot shades than to true pink. It could only be by a process of selection that most of the yellow would be eliminated, leaving a more nearly true pink in the cups.

Perhaps one of the first pink daffodils to appear was Apricot, registered by de Graaff Bros., Ltd., of Noordwijk, Holland, in 1898, and is reported in *The Daffodil Data Bank** as being descended from *N. pseudo-narcissus abscissus* × *N. pseudo-narcissus albescens*. One of its progeny, Rosy Trumpet, although not registered until 1952, was apparently in commerce for many years. It has quite amazing depth of color in the narrow, rather straight, long trumpet, being of deep rosy apricot and quite weather resistant. The long, narrow, twisted perianth segments are of dingy creamy white. Although a flower of very poor form, it was quite a decided break in color.

Doubtless the first widely acclaimed daffodil with "pink" coloring was Mrs. R. O. Backhouse, named for its originator, and for many years known as "the" pink daffodil. It set a standard for judging others as it was a step forward in its class, and some of its attributes could well be emulated in modern varieties, not the least of which was its vigor and fecundity. Among its faults that are still the bane of daffodil breeders are its propensity to give good coloring only under rather ideal conditions of soil, temperature, and humidity, and the proclivity to taking several days after opening to develop optimum coloring, followed by fading while the flower is still relatively fresh looking. It is generally conceded that Lord Kitchener, a widely grown bicolor of its day, was the seed parent of Mrs. R. O. Backhouse. The seed parent of Lord Kitchener was Minnie Hume, which in turn came from *N. pseudo-narcissus albescens*.

As the variety Mrs. R. O. Backhouse became well known, breeders everywhere began working for pink seedlings, whether they used this variety in their

pedigrees or not. Some having a personal dislike for the variety tried other lines and it was soon learned that Mitylene and White Sentinel gave occasional pink-cupped seedlings. The Brodie of Brodie in northern Scotland raised Wild Rose from the former using Evening, a pure white flower, as pollen parent. It was perhaps the purest pink introduced up to 1939. Unfortunately, it is even less dependable than some of the old varieties in giving good color consistently, but it is proving of some value to hybridizers. Rose of Tralee, raised by J. L. Richardson from open fertilized seed of White Sentinel, had less color but more substance and a larger flower than Wild Rose, and it in turn from open pollenized seed gave Salmon Trout, which is a flower of real show form although not too easy to grow well. In Northern Ireland, Guy L. Wilson used his little flower, Cushlake, which looks much like a poet, as a seed parent, with pollen from Dava, a nice perfectly formed 2c, then known as a large-cupped Leedsii. From the resulting seedlings he selected Interim, a tall-stemmed, quite large flower with white perianth, pale yellow crown widely banded apricot pink. It has proven very valuable for breeding pinks. Other good pinks originated by Mr. Wilson were Fintona and Passionale, two very smooth flowers of exhibition caliber and very pink at their best but somewhat unstable in coloring.

Doubtless one of the most successful varieties introduced by Mr. Richardson was Green Island, not because it was pink, but aside from its being an outstanding flower in its own right, it has proved most valuable for breeding pinks and other colors. Crossed on Templemore, it gave Mr. Richardson Rose Caprice, a flower of good color and substance but not very vigorous, but it, in turn, gives many good pink seedlings including the very new Romance which is not yet proved but is reported as being perhaps the finest pink yet introduced. Debutante, also from Rose Caprice, is a

* *The Daffodil Data Bank of the American Daffodil Society*—1965. Tom D. Throckmorton, The Computer Center, The Iowa Methodist Hospital, Des Moines, Iowa.

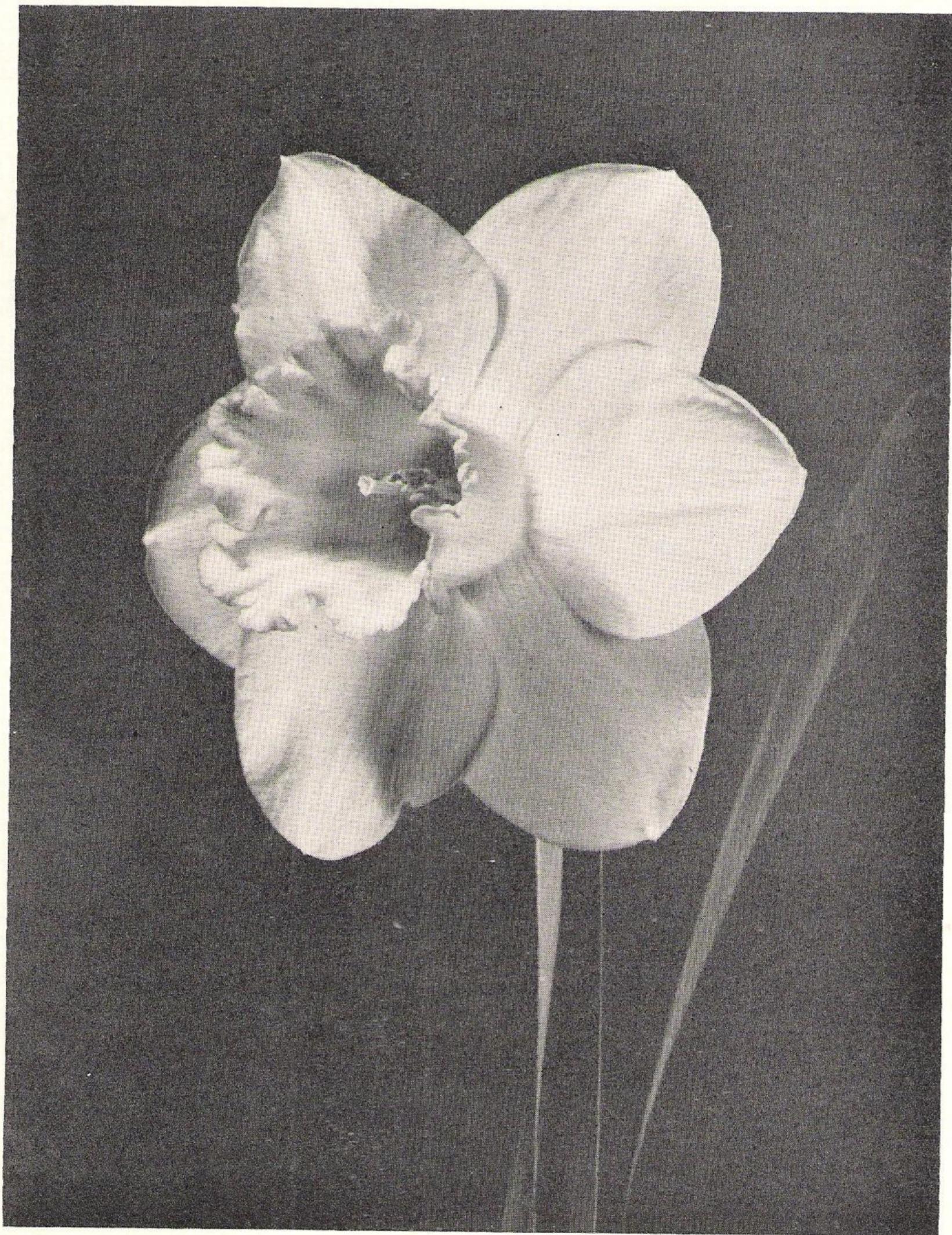


PLATE 47

RIMA
Large-cup (Div. 1b)

GRANT E. MITCH

very fine flower both in form and color and has been grown long enough to become distributed quite widely among fanciers but is still too new for wide garden usage.

In the 20's and 30's, fanciers in Australia were working avidly at producing pink seedling daffodils, and in Victoria, Alister Clark, of fame as a rose grower, introduced a good number of varieties. Doubtless his most successful one, and among the most popular of all pink daffodils today, was Mabel Taylor. It still leaves something to be desired in form, is not a true pink in the strictest sense of the word, and takes a little time after opening to develop its color. But it does have more color than most of the older varieties, and has a much frilled and ruffled crown which appeals to most gardeners. Added to this, it is proving a good parent.

On the island of Tasmania, keen competition developed among a group of daffodil fanciers as to who could show the best pink seedlings at their annual exhibitions. For some years they perhaps led the world in the development of exhibition varieties. One of the first, and the most successful breeder, was C. E. Radcliff who produced the pink trumpets Pink of Dawn and Dawnglow, the latter a large flower of excellent form and good color, but one that was difficult to grow in that it was very susceptible to disease. It is difficult to come by now, but would doubtless still be of value to hybridizers. Later introductions of his include Rosario, Karanja, and Pink Monarch of which the first has had quite wide distribution. Pink Monarch is a very spectacular flower but it, too, is a bit difficult to grow and it is prone to giving short-stemmed blooms. Several more recent introductions from Radcliff's son are reputed to be good flowers, but they have not been grown in the writer's garden.

Many other breeders in Australia have done significant work, and among them Oscar Ronalds deserves notice for the flower named for his wife, a tall-stemmed variety with very rounded, flat, overlapping white perianth, and a quite large, smooth crown of a solid good

shade of pink. It has been marketed for some years, yet in spite of being a good increaser, stock remains very limited in America. It appears to be very promising as bulbs become available in greater quantity. Due to the length of time involved in getting daffodils established and fully acclimated when they cross the Equator, varieties from the Antipodes are much longer in becoming well known and distributed here than those produced in the Northern Hemisphere.

Holland has always been known for its daffodil bulbs, and while other areas were turning out what they hoped would be improved pinks, Dutch breeders were also busy, and being more concerned about good garden flowers and varieties that could be propagated easily, they apparently used Mrs. R. O. Backhouse extensively along with Tunis and Daisy Schäffer. Most of the series introduced there at the close of World War II gave evidence of such ancestry. Among them were Siam, Pink Fancy, Pink Rim, and Rosy Sunrise. Larger size, some improvement in form, and a variety of shades of pink, apricot, and salmon characterized these flowers which are now widely grown.

In America, C. E. Bailey and the Oregon Bulb Farms pioneered with work in this section. Bailey's untimely passing in the early 1940's was a loss to the daffodil world, but his seedlings were purchased by Oregon Bulb Farms and one of his best was named Charles Bailey and introduced. It had a nice pink frilled crown. A large population of pink seedlings was raised at Oregon Bulb Farms under the direction of Jan de Graaff with a large series being introduced in 1950. A visit to his farm where he had scores of clones with 50 or more bulbs each was an exciting event twenty years ago. Out of these came Roman Candle, a large flower with salmon-pink, trumpet-like crown which is reported to color well in warmer areas. More recent introductions include Troubadour, pure white perianth and soft-pink crown, and the very spectacular Carita, a very large flower with broad white perianth, and a big saucer-shaped crown of rich apricot pink that colors well in

most areas. If it should prove a good grower and increaser, it will be immensely popular, but early indications are that it is erratic in behavior in a few locations.

In the past decade, improvements in form and color are showing nearly everywhere, but consistency in performance under all conditions, and coloring that appears when the flower first opens and is retained until it wilts, is still a goal for the future. Perhaps such a flower exists now, but if such there be, it remains unproven.

Some space will be given to the work done here at Daffodil Haven, not that it is of singular merit, but that it is more familiar to the writer than that done elsewhere. One of the first pinks to be introduced here was Radiation, a flower of quite good form with an apricot-pink crown, its parents being White Sentinel \times Mrs. R. O. Backhouse. It inherited much of the vigor of its pollen parent with better form. From a pale buff-yellow-cupped variety, Shadeen, crossed on Tunis, a few hundred seedlings were raised, one of which was selected for its deep salmon-pink crown, although it was of poor form and much lacking in substance; then it started making normal increase and was eventually named Interlude. Its pollen used on Interim produced Accent, a flower of exceptional substance and smooth texture, with strong rose-pink coloring that carries quite as well in the garden as

the vivid orange-red-cupped varieties. Already it has proved itself as a parent, and it is to be hoped that it will play its part in developing improved strains of pinks. Kenmare \times Dawnglow produced Rima, one of the relatively few large trumpet varieties with pink coloring, an apricot pink with a pale lilac suffusion. About the same time Flamingo appeared among seedlings from Coralie \times Dawnglow. Although one of the purest pinks seen here, it is not a very rapid increaser. When at its best Caro Nome becomes an appleblossom pink, but it varies in color tone from one locality to another. Perhaps its main claim to distinction is in its value to breeders. One more with similar ability is Precedent, a seedling from Green Island \times Mabel Taylor. With taller, stiffer stems than usual in its class, it has a large well-rounded, overlapping white perianth, and nearly flat, saucer-shaped crown of apricot salmon. Strangely enough, it not infrequently gives seedlings with decided lavender tones.

Vast strides must yet be made to obtain the ideal pink, and before it arrives our goals will doubtless be changed. The many thousands of seedlings being grown annually from "pink crosses" testify to the effort being expended. Hundreds of fanciers in addition to those mentioned here are involved in the search for that pervasive, but always elusive color! In the quest some superb flowers are certain to appear, be they pink or not!

—12—Tazettas

The tazettas came into garden use around the shores of the Mediterranean many hundreds of years before the coming of Christ. Numerous forms existed and some of the bulbs were conveyed into quite remote localities. Then in the 15th and 16th centuries the Dutch and English gardeners found the bulbs and their popularity soared almost as greatly as the tulip. Vast quantities of the bulbs were imported by the thrifty Dutch; so much so that many native haunts were completely denuded long before the end of the last century. In 1880 some 50 different variants had been recorded and as recently as 1907 A.M. Kirby listed 75 named garden forms. Then World War I brought about the sad devastation of the flower gardens of the Netherlands. Two harsh winters practically wiped out all tazettas from the Channel area. Only the hardiest of the clones survived. Lost stock could not be replaced. The many native colonies around the Mediterranean had long been stripped—just as many of the haunts of the wild daffodil are being pillaged today—and to top it off King Alfred and other hardy daffodils swept into the vacuum and captured the gardens by storm. Because of their hardier constitutions, the hybrid daffodils soon displaced the fickle, frost-sensitive tazettas in all areas but the Scilly Isles. Thus what we have today are the barest remnants of a vast vanishing race.

Currently there are barely half a dozen tazetta types to be found growing in the United States, and only three or four of these are commonly in the trade. There are several reasons for this marked decline here, too. Basically, as indicated, the natural habitat of the tazetta species is about the Mediterranean and in Turkey, and, consequently,

tazettas insist on growing conditions which are Mediterranean in character. There is little use in trying to fight Nature. Thus we find White Pearl, Paper White, and Grand Primo (very commonly called Grand Monarque in error), all growing in the milder parts of the South and the Gulf area. And in the Far West, bordering the Pacific Ocean in Oregon, Washington, and California, the most likely garden types are Paper White, the Chinese Grand Emperor, Grand Primo, Soleil d'Or, and occasionally the Minor Monarque or *italicus*. Once in a blue moon a true Grand Monarque, the dwarf *Canaliculatus*, or a *tazetta aureus* or two may turn up.

The tragic loss of the many wild tazetta variants is most unfortunate as this definitely restricts primary breeding stock. But despite this handicap, one can use much of the existing material and produce some exquisite hybrids. Crosses are easily effected with *triandrus*, *jonquilla*, poets, and the smaller trumpets. The secret of success is to keep the tazetta pollen warm, to work with potted material where temperatures during pollination can be held near 70° F., for the best of the tazetta pollen are completely inert at lower temperatures.

By crossing Grand Monarque and *tazetta aureus* onto a mixed group of intraspecific *triandrus* hybrids, one can obtain a kaleidoscope of mixtures ranging from the well-known Silver Chimes down to the still unregistered wee Golden Pleiades with its seven tiny golden-yellow blossoms. Many of these crosses are dwarfs and most can be grown indoors in seed flats with half a hundred bulbs to a flat.

The jonquil crosses are equally dainty and complex, and, although there are many Poetaz hybrids on the market, the

diversity can be enhanced extensively by using the pollen of Soleil d'Or or some other yellow tazetta. Good yellow Poetaz of the Yellow Elvira type are still relatively scarce.

Alec Gray's Cyclataz which is *cyclamineus* × *tazetta aureus* is reported as semifertile. Unquestionably other tazetta hybrids may also be semifertile. Thus advanced hybrids are possible, particularly if the hybrid pollen is used on the parental forms, for backcrossing may often take when all other combinations fail.

Perhaps we should digress for a moment to point out that as a group the Amaryllis family, which includes the genus *Narcissus*, is not an easy one to breed. Only very closely related species will cross and give second generation F_2 seedlings following the typical Mendelian breakup. On the other hand, relatively wide crosses are quite common, but a high level of chromosome stability and linkage causes a great deal of hybrid sterility. The few semifertile hybrid pollens will strike quite readily on the parental species or related subspecies, and the backcross B_1 hybrids are usually fairly vigorous and have a higher level of viability than the initial F_1 cross. By recrossing B_1 hybrids, or crossing a B_1 hybrid with the lesser parent, further chromosome incompatibilities can be broken down. Thus, after random crossing for several generations, a series of introgressive hybrids should eventually evolve which have a fair level of viability, considerable diversity, and the vigor of the initial F_1 hybrid. The writer has broken down the outstanding incompatibilities of the genus *Crinum* by doing this, and thus far several tazetta backcrosses give promise of equal response.

The classification of *N. tazetta* is based upon the colors of perianth and cup. The key has been in effect for some 90 years or more and there appears little cause to make any changes, unless the species are regrouped according to chromosome number. At one time E. A. Bowles stated that all bicolors were hybrids, but as we have become more familiar with the breeding behavior of the

plants we find this view difficult to accept. Bicolors, like the true Grand Monarque and the Chinese Grand Emperor breed quite true, suggesting a relatively homozygous chromosome complement typical of a wild population that has grown for untold centuries in some particular locality; whereas Grand Primo and Minor Monarque (*italicus*) are quite sterile, implying a hybrid source. Unfortunately, Grand Monarque, which was originally described as *Hermione floribunda*, came into garden use about 200 years ago, so we have no means now of establishing its original habitat other than it must have been from a very warm locality. The same applies to the Chinese Grand Emperor. True, the bulbs are Chinese in origin, but man could have carried them there from the eastern Mediterranean back in Marco Polo's time.

Tazetta Soleil d'Or has been identified as a triploid, but in warm weather it will self and produce a few seed and, although some seedlings turn out to be smaller Soleil d'Or, others are typical *tazetta aureus* with some randomization in size and width of the tepals. All are good breeders.

Paper White and the dwarf *tazetta panizzianus* have never been found to be good breeders. The hybrids lack substance in their perianth segments. This is probably one fault with White Pearl; the petals are thin and frail, being typically Paper White. All three plants produce seed and will cross.

Reference has been made to the confusion between Grand Monarque and Grand Primo. The two plants are very similar, but Grand Primo has a slightly shallower cup, is completely sterile, and produces numerous offsets. Both have been found to have a chromosome count of $2n=32$ which suggests either a $22+10$ or $33-1$ combination. One variant of Grand Primo has a cup that fades out to near white on the third day. A second variant is known as Grand Primo Citronière, but it is now uncertain from descriptions just how much yellow was present in the cup and perianth of this clone, so we do not know whether the plant is one still in circulation or not.

In contrast, Grand Monarque has fertile pollen, produces few offsets—less than one a year—and has a deeper cup with crenulated margins. In full sun the blossoms stand up in a compact mass facing directly into the sun. A fully matured bulb may carry 22 blossoms in an umbel. Several seedling variants are in circulation and *Compressus* appears to be one of these seedlings.

Most Grand Monarques grown in the Scilly Isles and Florida are actually Grand Primo. The writer obtained his original stock from Australia, and then located two colonies in Southern California. A critical study of the plants was published in the Royal Horticultural Society's *Daffodil and Tulip Year Book* for 1964 by the writer. The work

evolved from a painstaking comparison of E. A. Bowles' identifications of named clonal tazettas in his book, *The Narcissus* (1934), and J. M. Jefferson-Brown's list of specific names in his *The Daffodil* (1951). We are in complete agreement with Mr. Bowles, and the time and diligence devoted to the chapter on tazettas in his work has resulted in an invaluable reference.

The following classification, based on the grouping by Baker, covers all known garden tazettas which may be encountered in Australia, Europe, and America and indicates their known breeding behaviorism. The term "Cl. Hort." identifies the non-seeding horticultural clones. The number of florets given are those for a mature bulb after a good summer's rest.

I. Bicolor types; perianth white, corona yellow.

a. Cup orange or yellow.

CANALICULATUS (Gussone; a wild form derived from *N. tazetta* L. subsp. *lacticolor* Baker). 8 in. scape; 6-8 florets. Seldom flowers but pollen potent. Narrow perianth segments which do not overlap but form a star-shaped flower. The foliage is short and narrow, only $\frac{1}{4}$ the width of foliage of Grand Monarque. Probably a native of marshes. Several variations exist in southern France.

GRAND EMPEROR (derived from *N. t. chinensis**). 14 in. scape: 8-10 florets. Pollen active above 70° F. Exists in a number of variations including doubles and semi-doubles which are less common. Sold for forcing under such names as Sacred Chinese Lily and New Year Lily.

GRAND EMPEROR FLORE PLENO (derived from *N. t. chinensis* 'Flore Pleno'). 12 in. scape; 8-10 florets.

CYPRI (syn. *N. cypri*). A form of *N. t. chinensis* similar to but smaller than Grand Emperor.

ODORATUS. 9-10 in. scape; 8-10 florets. Pollen active. Similar to *Canaliculatus* in form, color, and scent, but much taller. Introduced by Alec Gray from bulbs collected in Scilly Isles.

b. Cup pale yellow.

GRAND PRIMO (syn. *N. orientalis* γ Ker-Gawler). Cl. Hort. 16 in. scape; 11-16 florets. Sterile. Shallow bowl-shaped cup containing fine radial pleats or folds. Produces numerous offsets. One variant has a cup which fades to nearly white on third day. The form which does not fade out is widely, but incorrectly, called Grand Monarque.

GRAND PRIMO CITRONIÈRE (syn. *Hermione citrina* Haworth). 11 in. scape; 8-10 florets. Sterile. Correctly illustrated as t. 180 in Jordan et Fourreau's *Icones ad Floram Europae* which is reproduced in *Daffodil and Tulip Year Book*, 1964, Fig. 32.

GRAND MONARQUE (syn. *Hermione floribunda* Haworth). 20 in. scape; 18-22 florets. Pollen active above 65° F. Correctly illustrated as t. 181 in Jordan et Fourreau's *Icones ad Floram Europae* which is reproduced in *Daffodil and Tulip Year Book*, 1964, Fig. 33.

* See E. A. Bowles, *The Daffodil* (1934). pp. 157-8.

Differs from Grand Primo by cup-shaped corona with a deeper rim and stronger shadings of citron. Often confused with *Compressus non* Haworth.

COMPRESSUS (non Haworth; *Compressa* of the trade). Cl. Hort. 18 in. scape; 20 florets. Pollen active above 65° F. Probably siblings or seedlings of Grand Monarque. White reflexing perianth and bright yellow corona. Makes a large bulb. Reported in France. Registered as *Avalanche* in 1955 by T. M. Dorrien Smith. *Compressus* of Haworth is said to be a wild form of \times *intermedius* (*N. tazetta* \times *N. jonquilla*).

SCILLY WHITE (syn. *Hermione leucoifolia* Salisbury). Cl. Hort. 14 in. scape; 10-12 florets. Not found in the United States. No information as to breeding behavior.

MINOR MONARQUE (derived from *N. tazetta* L. subsp. *italicus* (Sims) Baker). Cl. hort. 20 in. scape; 9-10 florets. Sterile. Narrow cup and long, twisting, pointed segments colored very pale sulphur yellow.

WHITE PEARL (derived from *N. tazetta* L. subsp. *polyanthos* (Loiseleur) Baker). Cl. Hort. 18 in. scape; 6-8 florets. Pollen active. Thin, milk-white perianth. Commonly found in Florida.

II. White types; perianth and corona both white.

PAPER WHITE (derived from *N. tazetta* L. subsp. *papyraceus* (Ker-Gawler) Baker). 16 in. scape; 10-12 florets. Viable. Popular for forcing. Many very minor variations were once on the market.

PAPER WHITE MINOR (derived from *N. tazetta* L. subsp. *Panizzianus* (Parlatore) Baker). 10 in. scape; 11 florets. Small-cupped variant of Paper White. Viable.

III. Yellow types; perianth and corona both yellow.

SOLEIL D'OR (derived from *N. t. aperticorona* Haworth, a wild form of *N. t. cupularis* (Salisbury) Baker). 17 in. scape; 12 florets. Partially viable. Deep orange cup and bright orange perianth. Noticeable variation in the width of the perianth segments exists. An old plant, possibly from Africa, and *N. t. bertolonii* may have been an ancestor. Widely sold for forcing under the name Grand Soleil d'Or. Has a form, possibly a sport, which is slightly smaller with particularly viable pollen.

aureus (Loiseleur) Baker. 12 in. scape; 9-10 florets. Very viable. Width of perianth segments indicates some variation. A wild form.

bertolonii (Jordan) Baker. 9 in. scape; 6 florets. Properly viable. Miniature. Nearly black bulbs which do not increase very rapidly. A wild form.

—13—Daffodils: Early and Late

The first daffodil of spring is a delight, the last a treasure. In between these two there are many joyful flowers, but here we shall discuss only early and late varieties.

Two factors contribute to early or late bloom. First is the inherent trait of a flower for bloom at a certain time. The other is the location in which it is grown. To plant an early variety in a late location is to cancel out the advantage of its earliness. A late variety in an early location not only loses the advantage of lateness, but may be ruined by heat if it receives the reflection from a hot wall.

It is warmth, of course, provided by ample sun and protection from cold winds, that makes an early location. The sun and protection should be there all winter to give the greatest advantage. The south side of a wall, a southerly slope of ground, the sheltered side of a thick shrub planting where the low winter sun can strike and its increasing heat be effective, make a tremendous difference in the time of the upward push of growth. The ground toward the top of a slope is earlier than that at the bottom, as long as it is out of the sweep of the wind.

For a late location, look for a place that is shaded from the winter sun, where the ground stays frozen and cold for a long time. Late flowers can also be helped by some shade in the hot part of the day. High shade from two or three o'clock on is ideal. However, like all plants, the late daffodils do need sun and light for proper growth, preferably in the morning. It is holding them back in the beginning and then shielding the flowers so that they can develop proper-

ly and do not fade too soon that count.

There might be a third factor considered: the weather fluctuations in a given place at a given season, which can telescope or extend bloom periods. But this factor cannot be controlled by the gardener, who, for contentment of mind, must accept weather reverses calmly, while welcoming any blessings it may bestow gladly, though mulching and watering may alleviate some of its extremes.

Given the availability of early and late locations—and every garden has them to some extent—next comes the choice of varieties to make the most of them. In the earlier, there are many yellow trumpets, and yellow and red large cups are plentiful. There is also a good choice among the yellow cyclamineus hybrids. The choice of pale varieties and in other divisions is more limited, but it is possible to have diversity.

In the lates, the small cups predominate, many with some coloring in the cups (the varieties of the poet's narcissus are all white with red or orange in the eye), and some all white. There are also late jonquils to give pure yellow, and enough other kinds to give contrast to the dominant pale or white small cups.

Unfortunately, many catalogs and dealers are short on the small-cupped varieties in Div. 3. A search must be made beyond accustomed sources for these lovely flowers. There are a few suppliers in this country, and those who wish to take the trouble to import bulbs will find a good choice in the British Isles.

EARLY VARIETIES

* — especially early

** — earliest of all

(M) — miniature

1a Pale yellow trumpets: Grape Fruit, Moonstruck, *Mulatto (sometimes *Id*).

1a Golden yellow trumpets: *Forerunner, Golden Harvest, Joseph MacLeod, Little Beauty (M), *Lord Nelson, Magnificence, Scotch Gold (very deep color), Sun Dance, *The First, Unsurpassable, *Wee Bee (M).

1b Bicolor trumpets: **Bambi (M), Chula, Foresight, Jefta, Lapford, Mirth, Patria, Preamble, Zest (very pale).

1c White trumpets: *Ada Finch, *High Sierra, Silverdale.

2a Large cups, perianth yellow, corona orange or orange red: Armada, Ceylon, Fortune, Golden Bracelet, Golden Treasure, *Hollywood, Illuminate, Krakatoa, Red Sunrise, Rouge, Sacajawea, Tinker, *Whiteley Gem.

2a Large cups, self-yellow: Aerolite, Carlton, Cibola.

2b Large cups, bicolors, all coronas rather pale: *Brunswick, *Penvose, Pink Rim, Promisso (pale pink corona), Silver Standard, South Pacific.

2c Large cups, all-white: Dunfane (opens 2b), Parkmore, Shining Waters, *Snow Dream.

4 Doubles: Bridal Crown, Hollandia, Telamonius Plenus (syn. Van Sion).

6a Cyclamineus hybrids: **Bartley, Caerhays, **Estrellita, **February Gold, *February Silver, *Garden Princess, Le Beau, March Breeze, March Sunshine, Mite, *Peeping Tom.

7a Jonquil hybrids, self-yellow: Penpol, Shah.

10 Species, Wild Forms, etc. *N. asturiensis* (M), *N. pseudo-narcissus* (M).

There are also early forms of old daffodils in certain localities, sometimes in old gardens or on abandoned homesites which are worth growing if a few bulbs can be begged from the owners or salvaged from the weeds.

The tazetta varieties of Div. 8 are very early in those sections of the country south of the Mason-Dixon Line

where a mild climate allows their culture. The well-known Paper White (*N. tazetta papyraceus*) is a winter bloomer, followed shortly by the yellow Soleil d'Or and a white and pale yellow tazetta of uncertain identity. Other tazettas under unreliable but charming names may be found locally in the South.

LATE VARIETIES

* — especially late

** — latest of all

(M) — miniature

1a Yellow trumpets: Arranmore, Bastion, Counsellor, Golden Riot, Spanish Gold.

1b Bicolor trumpets: Hillsborough, Rathkenny.

1c White trumpets: Ambassador, Cameronian, Dunluce, Weisshorn.

2a Large cups, perianth yellow: Badger, Ballintoy, Cargan (self), Red Squirrel.

2b Large cups, perianth white: Alicante (bright orange corona), Tryst.

2b Large cups, corona pink: Azalea, Magic Pink, *Rose of Tralee, Roseanna, Sweet Talk.

2c Large cups, all-white: Corby, *Pigeon, St. Moritz.

3a Small cups, perianth yellow: Alcida (self), Russet (red cup).

3b Small cups, perianth white, cups bright: *Algeciras, **Corncrake, *Kildrum, *Pride of Erin, *Willowfield.

3b Small cups, perianth white, cups softly colored: *Dreamlight, *Grey Lady, *Misty Moon, **Reprieve.

3c Small cups, all-white: *Bryher, *Cushendall, **Frigid, *Portrush, **Silver Princess, *Silvermine.

4 Doubles: *Falaise, *Gay Time, **Patricia, *Rose of May, ***N. Poeticus* 'Flore Pleno' (syn. 'Albus Plenus Odoratus').

7b Jonquil hybrids: *Bebop (M), **Happy End, **Kidling (M), *La Belle (M), *Tittle-Tattle.

9 Poets of garden origin: *Cantabile, *Milan, *Sea Green, *Shanach.

10 Species, Wild Forms, etc.: ***N. poeticus recurvus* (Pheasant's Eye), **N. × biflorus*, *N. poeticus verbanensis*.

The daffodils in these lists are all priced at close to a dollar or under, many of them well under. All are supposedly in commerce at the present time. We have grown most, but not all of them.

Not included in the lists are four that we value very highly. Cornet, a well-formed golden 6a, may not be in commerce, but it is such a splendid extra-

early flower that perhaps some day it may be. Omitted because it still costs about \$3 is the lovely, very early Woodgreen, a 2b. The corona, almost a trumpet, is pale lemon which deepens a little at the rim; the perianth, of course, is white. Two very late poets seem to have disappeared from the lists: Lamplighter and Lights Out. Anyone who has a chance to acquire any of these should not miss the opportunity.

—14—Miniature Daffodils

While small daffodils have been around just as long as large daffodils, any awareness that there could be perfection on a small scale or that satisfaction and pleasure could be found in studying and flowering the less pretentious forms of daffodils is quite recent. The heretical idea that smaller daffodils deserved any space in a garden, except possibly a rock garden, or that they were entitled to be shown and judged on equal terms with their more generously proportioned kin is recent indeed.

By today's standards most of the raw material with which the early hybridizers began their work was small. Their goals were not only better form and greater substance, but larger size. Crossing the small species and the best of the available hybrids inevitably produced a percentage of seedlings marked by small size, most of which were discarded at once or subsequently lost. A few, such as Colleen Bawn (1889), lingered on in gardens; others, such as W. P. Milner (1884), have shown their ability to take care of themselves; and a small number, such as Sea Gift and Pencrebar have been salvaged and propagated by someone who cared.

For many years the smaller hybrids were considered the chaff of the genetic process. It was as recently as the 1920's that they caught the fancy of a Cornishman, Alec Gray, who began to collect them and eventually to hybridize them with the curious notion of creating smaller daffodils. Eventually his accomplishments were displayed at the daffodil shows of the Royal Horticultural Society where they attracted much attention and resulted in his being awarded the Peter Barr Memorial Cup of the Society in 1946. However, commercial hybridizing in the British Isles has been and continues to be, largely confined to Divs. 1-4

and since the professionals tend to dominate the daffodil shows of the R.H.S., the smaller daffodils, especially miniatures, are still the poor relations of an expanding family of trumpets and large cups. Such interest and advancement as exists is found among the amateur growers and hybridizers, notably D. and J. W. Blanchard (father and son), Sir Frederick Stern, and Cyril F. Coleman, as well as Alec Gray who has disposed of his catalog business and now is hybridizing only.

It seems quite clear that the first person in this country to give serious attention to small daffodils; to hybridize them for the sole purpose of creating smaller, rather than larger, daffodils; and to infuse others with her enthusiasm was Roberta C. Watrous of Washington, D. C., gardening in her city backyard. Mrs. Watrous has registered several small daffodils as has Matthew Fowlds of Canby, Ore. The principal show honor which miniature daffodils can win in the United States is the Roberta C. Watrous Award, a gold or silver medal, for a collection of 12 miniatures from at least three divisions exhibited at a show approved by the American Daffodil Society.

We have yet to make the distinction between small daffodils and the miniature daffodils with which this chapter is concerned. It is not an easy problem. The term "miniature" has been loosely applied in connection with all small daffodils. As a rule, the triandrus, cyclamineus, jonquilla, and tazetta hybrids; the species and wild forms and wild hybrids; in fact, all species and garden varieties with the possible exception of the poets, falling within Divs. 5 to 11 of the Official Classification, are smaller in all their parts than the trumpets and cupped varieties. For

that reason many tend to lump all these smaller daffodils together and consider them miniatures.

About 20 years ago the Royal Horticultural Society decreed that a miniature daffodil could not exceed 12 in. in height and 2 in. in width with the perianth segments flattened out. These dimensions now seem rather generous in view of the rising number of very small varieties and they present certain difficulties in application to both exhibitor and judges, but they have served the limited needs of English shows thus far.

In the United States a group of small-daffodil admirers began to grapple with the question of defining a miniature in 1958. The need for such a definition was evident from the variety of ways show committees attempted to specify the flowers which would be admitted to their miniature classes. The decisive factor was usually length of stem, although there was no agreement as to the precise length and problems of enforcement were ignored. Occasionally it was ruled that the size of the flowers should be in proportion to the length of stem, but this relationship was never reduced to a mathematical ratio. The result of such confusion was that a variety which would be qualified as a miniature at one show would be disqualified at another.

After several years the group concluded that it was impossible to frame a definition which would operate consistently and result in a way which was satisfying to the eye. Therefore, it was concluded to compile an arbitrary list of species and garden varieties which, after careful field study, should be classed as miniatures in the opinion of a number of observers. These observers were asked to consider: 1) whether the variety would appear at home in a rock garden, and 2) whether it would appear out of place on the show table among other varieties of standard size for the division. Surprisingly, this voting of an arbitrary list produced nearly general agreement.

The committee's study resulted in a report which was presented to the an-

nual meeting of the American Daffodil Society in 1963 and adopted. The list of miniature daffodils contained the names of 75 hybrid cultivars and nearly 50 species, wild forms, or wild hybrids. The report also provided for a watchdog committee to add the names of qualifying introductions and to delist others which did not seem to meet the standards after further observation. The list was revised in 1965 and may be found in Appendix B.

Without attempting to comment on every name carried on the approved list, some observations on the desirability and availability of the species and hybrids may be useful to those who have the urge to try the smaller daffodils. For convenience, the species will be considered along with their hybrid progeny rather than be lumped together as they are in the Official Classification.

N. pseudo-narcissus, the Lent Lily, is a common miniature trumpet of no particular garden value. The best of this type, *N. asturiensis*, would be desirable for its extreme earliness, if for nothing else, but, in fact, the better forms of it are superior to all other wild trumpets with the possible exception of *obvallaris* which is not a miniature. *N. minor* (*nanus* of the trade) lacks clear coloring and is long on bulbs but short on flowers. Its varieties *conspicuus* (*lobularis*) and *pumilus* are somewhat better.

Three miniature trumpets are of uncertain origin; possibly sports or selected forms of the smaller trumpet species. Wee Bee is the best of these. It is of Dutch origin and said to be a sport of *minor*, possibly *minor conspicuus*. It is a soft yellow, vigorous, and of smooth form, although slightly hooded. Charles Warren is earlier and has a larger flower than Wee Bee. It resembles *minor pumilus*, although the latter is somewhat larger and later. Its origin is unknown; Alec Gray states that he found it on a bank in Cornwall. Little Gem is a slightly larger clone of *minor* selected by J. Gerritsen.

Almost all the smallest trumpets have *asturiensis* in their breeding. They are not difficult to create and they are en-

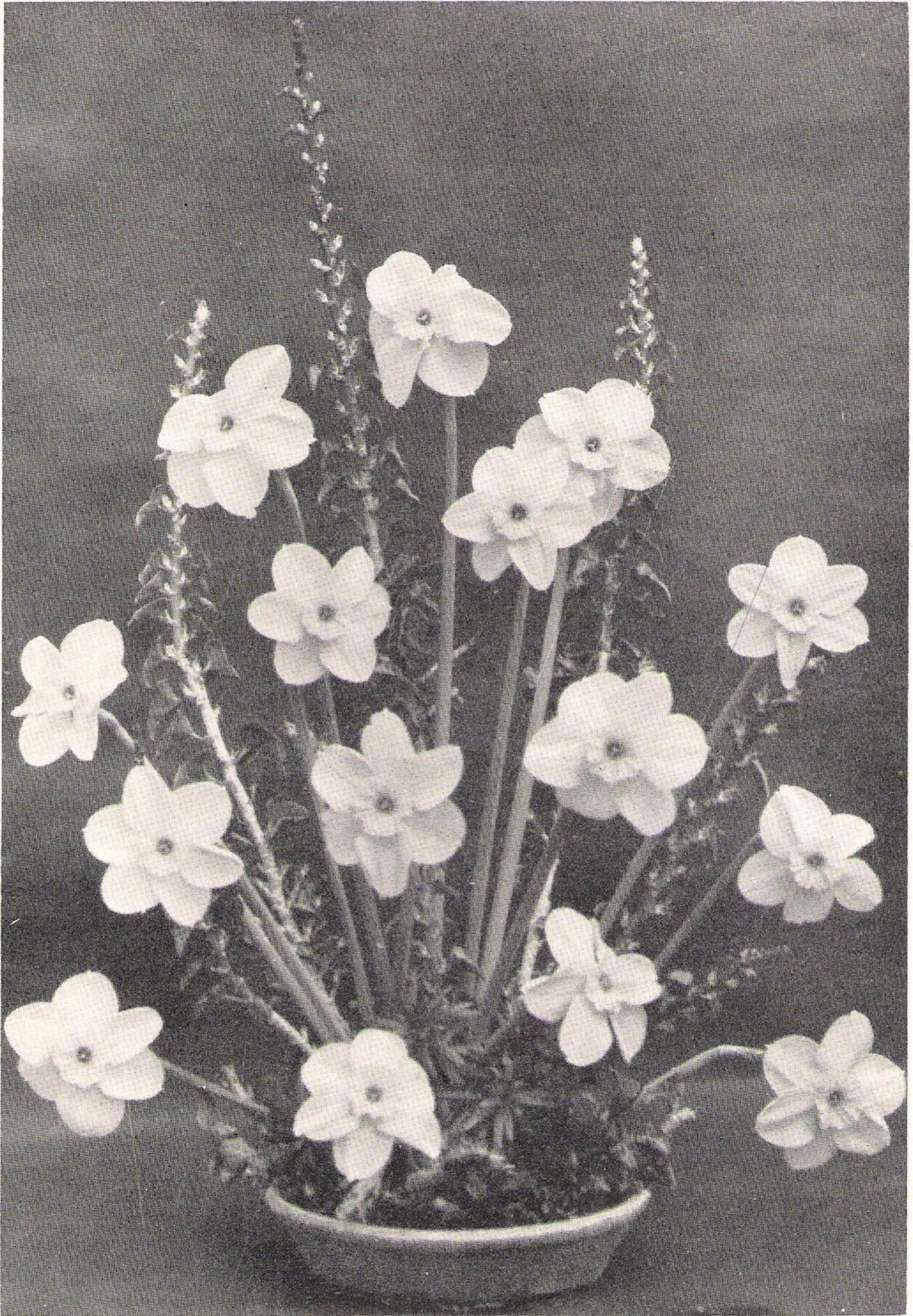


PLATE 48

ALEC GRAY

STAFFORD
Jonquilla Hybrid (Div. 7b.)

tirely fertile, but they increase very slowly and only two have been introduced—Sneezy and Tanagra—and both are hard to locate. Tanagra is a delightful tiny trumpet following right on the heels of *asturiensis* in starting the season. Sneezy is a self-yellow seedling of *asturiensis* × *obvallaris* with a largish flower on a stiff 4-inch stem. Little is known of Bowles's Bounty beyond the interesting fact that it was bred by the famed E. A. Bowles and registered by Gray in 1957; if introduced, it seems no longer to be found.

There are one species and three hybrid bicolor trumpets which have qualified as miniatures. *N. bicolor* is a sturdy, easygoing species which is occasionally offered. Bambi is a sport of *pseudo-narcissus* from Holland. It is very early, very prolific, and very cheap, but hardly a show flower. Little Beauty is a Gerritsen production of better quality and scarcely more expensive. Rockery Beauty is a tidy Dutch variety of good form but not often listed.

Miniature white trumpets present difficulties. *N. alpestris*, the only species, does not long survive in cultivation. All white trumpets, miniature as well as large, have been troubled by weak constitutions. From a number of old varieties, only two—W. P. Milner and Colleen Bawn—have survived and are still in commerce. The first goes all the way back to 1884 and Henry Backhouse, the first of three generations of distinguished figures in the daffodil world. The latter is almost as old, but a clone of *alpestris* selected by W. B. Hartland. These are sturdy garden flowers. Rockery Gem and Rockery White are modern Dutch varieties difficult to find. Snug is a recent Gray introduction, still scarce.

There are few miniatures in Divs. 2 and 3. All plants in these divisions should have *poeticus* somewhere in their ancestry. Wild or hybrid poets are tall plants and it is difficult to shrink their descendants to miniature size. The small supply in these two divisions is mostly concentrated in a group of five 2a's: Marionette, Morwenna, Mustard Seed, Picarillo, and Rosaline Murphy; all are very scarce although still in existence.

N. × macleayi (possibly *poeticus* × *pseudo-narcissus*) is a wild hybrid with the correct parents for a cupped daffodil, if they are, in fact, *poeticus* × *pseudo-narcissus* as the *Classified List* states. There is some evidence of tazetta ancestry but, in any event, bulbs of it are quite scarce. It has a bright yellow cup, white petals, and very broad foliage.

Other than these rarities, the only other miniatures in these popular divisions are a pair by Gray: Tweeny (2b) with white perianth and citron-yellow cup bred from a seedling 2a × *N. watieri* and Xit (3c) which is supposed to be pure white but is, in fact, a hybrid group and the cup may come either white or shades of cream. Its breedings is given as *watieri* × a large 2c.

There are several small doubles, all of unknown origin but doubtless mutants. Possibly the oldest of these—the *Classified List* is content to say "before 1601"—is Eystettensis (*capax plenus* of the trade). Rip van Winkle (*N. minor pumilus* 'Plenus') is a venerable oddity not unlike a dandelion. To call it quaint is to flatter it. The double jonquil, *N. jonquilla* 'Flore Pleno', is a golden ball, sweetly scented but very susceptible to stripe. Kehelland is a Gray introduction of rose-like form in soft yellow, possibly a sport of *minor*. Pencrebar and Wren are double jonquils, the first was found in Cornwall, and the latter which is similar but somewhat larger, more vigorous, and slightly different in color, came from southern Ireland. All the doubles can be bought with little trouble.

All the subspecies of *N. triandrus*—*albus*, *Aurantiacus*, *concolor*, *loiseleurii*, and *pulchellus*—are regarded as miniatures and there are many charming hybrids. Most are small-cupped 5b's, but F. R. Waley found a large-cupped natural hybrid with four creamy-white flowers in his garden which he named Sennocke. He believes it to be *triandrus* × *minor*, but crosses of *triandrus* × *bulbocodium* give a similar flower. Shrimp is equally delightful with parentage of *juncifolius* × *triandrus albus*. Mary Plumstead is a faster increaser and

therefore in better supply. It resembles April Tears in pale yellow.

Among the small-cupped *triandrus*, the favorites are a pair of half-sisters, Hawera and April Tears. *N. jonquilla* is the seed parent of each; the former by *triandrus albus*, the latter by *concolor*. Hawera came to us from New Zealand and is earlier but rates below April Tears in form and color, although the latter, like most of the *triandrus*, is not happy everywhere. Gray's Raindrop (*N. triandrus* × *N. × dubius*) holds an Award of Merit and has been greatly admired, but it is doubtfully hardy and all but lost. Gray has given us three other well-bred varieties in Frosty Morn, pure white; Cobweb, cup shaped yellow; and Arctic Morn, flushed pink. All these normally have several pendant flowers.

The miniature cyclamineus hybrids are concentrated in Div. 6a because of the length of trumpet of *cyclamineus* itself and the fact that crosses are made with other trumpets. *Poeticus* and the tazettas appear only occasionally in the parentage.

Mini-Cycla combines *asturiensis* (formerly *minimus*) and *cyclamineus*. It is not very robust, nor is Greenshank which is similar but has W. P. Milner as a seed parent. Jetage is superior to both. Jumblic and Tête-a-Tête, along with Quince, the only 6b miniature, all came from a single seed pod on Cyclataz (*cyclamineus* × *Soleil d'Or*). These are all splendid flowers and Gray, as well as many gardeners, regards Tête-a-Tête as the most satisfactory plant he has ever raised. Jumblic is similar but has reflexed petals. Snipe, with the same parentage as Greenshank and both from the hand of the late A. M. Wilson, is the only white 6a. It increases slowly, but its pale, long-trumpeted flowers are remarkably longlasting. Mite and The Little Gentleman came to us from the Antipodes and both are desirable and available.

The miniatures reach their climax in the jonquil group where there are a great many fascinating species and hybrids, most of which are listed by dealers. Because the species of this group have

short cups, the hybrids are nearly all Div. 7b. The only 7a's are Little Prince and Skiffle, neither of which is obtainable.

Nearly all the hybrids are the result of inter-specific hybrids and the primary species involved have been *N. jonquilla* (*simplex* of the trade), *N. rupicola*, and *N. juncifolius*, *N. watieri*, *N. calcicola*, and *N. fernadesii* have been used less frequently. When outside blood is introduced, it is likely to be that of *poeticus*. All of these jonquil species are quite small except *jonquilla* whose progeny tends to be larger.

N. atlanticus, *N. rupicola* var. *marvieri*, and *N. scaberulus* are all charming but rare miniature species, especially *atlanticus*. *N. jonquilla minor* and *N. jonquilloides* are so busy splitting that they rapidly become a clump of grass-like foliage without flowers. *N. × tenuior*, the "Small Straw-colored Jonquil", is an interesting old garden form of unknown origin. All the jonquil species are desirable in the garden, although some may be hard to locate and success cannot be guaranteed.

The current approved list of miniatures names 18 hybrid jonquils, 10 of which are attributed to Alec Gray. Five are from *rupicola* × *poeticus*: Bebob, Bobbysoxer, Stafford, Sundial, and Sun Disc. These are naturally somewhat similar, but all-yellow Sun Disc was the first to be registered. Bobbysoxer is taller and the cup becomes orange with a reddish edge. Bebob is similar in form to Sun Disc but gives us a white perianth with yellow cup and is later. Stafford brings us back to the yellow-orange combination of Bobbysoxer and is otherwise similar except for being earlier and having prostrate foliage. Sundial is earlier and smaller than Bobbysoxer and an all-yellow with a greenish cast.

A similar cross—*juncifolius* × *poeticus*—has given us two more excellent miniatures, La Belle and Lintie, both by Peter H. Barr. The latter is an especial favorite, yellow with a flat orange-red disc, late, and anxious to please. Another good doer and rapid increaser is Gray's Kidling (*jonquilla* × *juncifolius*). It is quite late, free-flowering,

and even more fragrant than most jonquils. Demure gets its refinement from *watieri*; it is white with a pale yellow cup. Pease-blossom is a very tiny primrose flower with triandrus blood, often twin-flowered. Sea Gift is a small self-yellow jonquil found by Gray in a Cornish garden and probably of Spanish origin.

Gerritsen has introduced Baby Moon and Baby Star. They both resemble *jonquilla* and are somewhat on the large size but free-flowering and very late. The only American introduction in this division is Pixie by Matthew Fowlds. It is from the same cross as Kidling and is similar but earlier with 3-5 one-inch flowers on a stem. Mrs. Watrous has registered, but not yet introduced, Curlylocks and Wideawake in this division.

After Div. 7 the miniatures wane rapidly. The only species with which we could be concerned among the tazettas are *N. × dubius*, a wild hybrid, scarce and shy with its flowers; *Canaliculatus* which is overly generous with its bulbs but stingy with its flowers; and *N. tazetta bertolonii*, a rare self-yellow native of North Africa. The few tazetta hybrids leave a good deal to be desired. Halingy and Hors d'Oeuvre are not very good flowers nor easy to handle. Shrew and Angie are the result of unusual matings which may explain their testy dispositions and scarcity. Cyclataz is a vigorous oldtimer with yellow perianth and deep orange cup but is not reliably hardy in the North.

There are no miniature poets and the miniatures come to an end in Div. 11 with all the bulbocodium and cantabricus species and a handful of bulbocodium hybrids raised by the Blanchards: Jessamy, Muslin, Nylon, Poplin, Taffeta, and Tarlatan. Their determination to grow and flower when other self-respecting daffodils are dozing makes them unlikely subjects for Northern gardens, but they do well in coldframes or a greenhouse and are successfully flowered outdoors where winters are less severe. Elfhorn, Kenellis, and Marychild are introductions by Gray in this division which are scarce.

Gardeners desirous of trying miniature daffodils with assurance of availability, variety, moderate cost, and success might consider the following dozen:

- | | |
|-------------------|---------------------------|
| 1a. Wee Bee | 6a. Tête-a-Tête |
| 1b. Little Beauty | 7b. Bobbysoxer |
| 1c. W. P. Milner | 7b. Demure |
| 3c. Xit | 7b. Kidling |
| 5b. Hawera | 10. <i>N. asturiensis</i> |
| 6a. Jumblic | 10. <i>N. rupicola</i> |

The American Daffodil Society has accepted the responsibility of examining future small daffodils as they are introduced to determine whether they should be added to the approved list of miniatures. A number have been named, registered, and are only waiting until adequate stocks accumulate before they are placed on the market. These include Rupert (1b), Segovia (3b), Paula Cottell (3b), Doublebois (5a), Poppet (5a), Yellow Gem (5a), Icicle (5b), Flute (6a), Soltar (6a), Rikki (7b), and West Wind (7b). While these are reported to be small, they will not necessarily prove to be acceptable as miniatures.

While the primary purpose of the approved list of miniatures is to improve their competitive position at daffodil shows, it has other important effects. For one thing, "miniature" as applied to daffodils is no longer an ambiguous term. It should be used only in connection with species and garden varieties named on the approved list. Oral discussion and correspondence can be carried on with mutual understanding, and it is expected that horticultural literature and bulb catalogs will gradually accept the proposed classification. It should be emphasized, however, that existence of a list of miniature daffodils does not tamper in any way with the Official Classification of the Royal Horticultural Society. The small trumpet Wee Bee continues in Div. 1a. It is now merely identified as a trumpet of very small proportions.

Interest in all smaller daffodils is on the rise in the United States and quite possibly is greater here than in England or Ireland; certainly greater than in Holland, Australia, or New Zealand. Fashions in daffodils abroad have been

shaped by the hybridizers in the British Isles and Holland and greater size has been the common objective. Australia and New Zealand have followed the lead of the United Kingdom. The chief difference is that the English and Irish hybridizers from Engleheart to Richardson and Wilson have sought large flowers of perfect form for the show bench, while the Dutch, with their eyes on the commercial market, have bred for large and spectacular garden varieties. With the exception of the catalogs of Walter Stagg who purchased the stocks of Alec Gray and, to some extent, of Michael Jefferson-Brown, the young Cornwall grower who abandoned a teaching career, European daffodil catalogs have always neglected the smaller forms, i.e., those falling within Divs. 5 to 11 of the Official Classification.

Growing interest in smaller daffodils on the one hand, and limited breeding for new varieties and slowness of increase on the other, have created a very tight market situation. Miniatures are often sterile and varieties which increase slowly are unprofitable commercially. While a source for the triandrus, cyclamineus, and jonquilla hybrids which have comparatively small flowers, but are not all true miniatures, can usually be found by a determined gardener, many of the varieties on the list of miniatures are quite scarce and the demand is growing more rapidly than the supply.

The growing of miniature daffodils will always be rewarding to those who are fascinated by perfection on a small scale, but the field will never be crowded. However, miniature daffodils have some definite advantages over flowers of standard size. Most importantly, they will advance the season for the impatient gardener to whom the daffodil symbolizes the advent of another year. *Asturiensis* and Tanagara are likely to precede February Gold, itself a comparatively small flower, but not a miniature, by a couple of weeks. Fortune, the first widely grown large flower, will be still later by a few days. In addition, the season is lengthened by the appearance of *juncifolius*, *scaberulus*, Baby Star, Tweeny, and some of the triandrus species and hybrids after the large flowers have passed.

While some of the species miniatures can be a bit temperamental, as a rule the miniature garden varieties are less demanding than their larger colleagues. Genetically closer to their species forebears which grow in the mountains of the western Mediterranean, they are quite contented in a lean, stony soil which is hot and dry in summer and cold and windy in winter. The exception is *cyclamineus* which must have moisture and tolerates, if it does not prefer, shade. The special cultural requirements of miniatures are fully considered in Chapter 2.