

—21— Daffodil Bulb Trade

Daffodil bulbs are produced for the commercial cut flower grower, the home gardener, the park and estate landscape worker, and for the fancier. In the southern part of the United States and on parts of the Pacific Coast the bulbs are planted for outside cut flower production, but in the northern part of the Middle West early flowers must be produced under glass. In either case the growers of flowers for sale need ample supplies of reasonably priced bulbs. In addition, those growing flowers under glass need daffodils suitable for forcing, since all daffodil cultivars do not force equally well. For many years the daffodil most widely used for such greenhouse forcing has been famed King Alfred, registered in 1899, nine years after the death of its raiser, John Kendall, who did not see it flower.

Daffodils for the average home gardener must also be moderate in price. His main interest is in having a colorful display with as little cost as possible. He is not too concerned as to whether the bulb he is buying is King Alfred, Golden Harvest, or Unsurpassable, although he may have heard the name of the first one at some time.

On the other hand, the daffodil fancier grows them as a hobby and frequently spends a considerable sum of money to buy the novelties for show purposes, for the pride of having something new, or for use in daffodil breeding. It is this specialist who publicizes the newer introductions by exhibiting them at recognized shows where these cultivars soon receive widespread publicity if they are successful on the show bench.

The professional landscape gardener who uses daffodils for color in the early spring gardens has a certain amount of influence on daffodil production. He,

too, will tend toward the less costly bulbs whenever they will give him the desired color effect.

INFLUENCE OF CLIMATE ON COMMERCIAL PRODUCTION

The cultural requirements of the various divisions of the genus *Narcissus* have in a large measure determined where they can be most successfully grown on a commercial scale. Thus, certain narcissus of the tazetta group can be best produced in regions where the climate is similar to that of the Mediterranean basin. Normally the tazettas begin growth in the autumn and are seriously injured by severe winters. In contrast are the hardier members of the genus which do not send up leaves until early spring and need a prolonged cool growing season if they are to show a good bulb increase. Bulb areas in the Netherlands, the British Isles, and the coastal parts of Oregon and Washington afford such cool growing conditions extending for some weeks after the time of flowering.

Daffodil bulbs are at present produced commercially in several parts of the United States, the principal states being Oregon, Virginia, and Washington. Daffodil growing on a limited scale in Virginia goes back many years if we are to judge by what has been found growing on old abandoned estates such as Leesylvania Plantation. There, on the shores of the Potomac River in Prince William County, old daffodil Van Sion found a home on the estate first lived on by the owners in 1747. It was apparently sometime between that date and 1790 that the plantings were made since the house burned on the latter date and was not rebuilt. The descendants of those early immigrant bulbs still flower

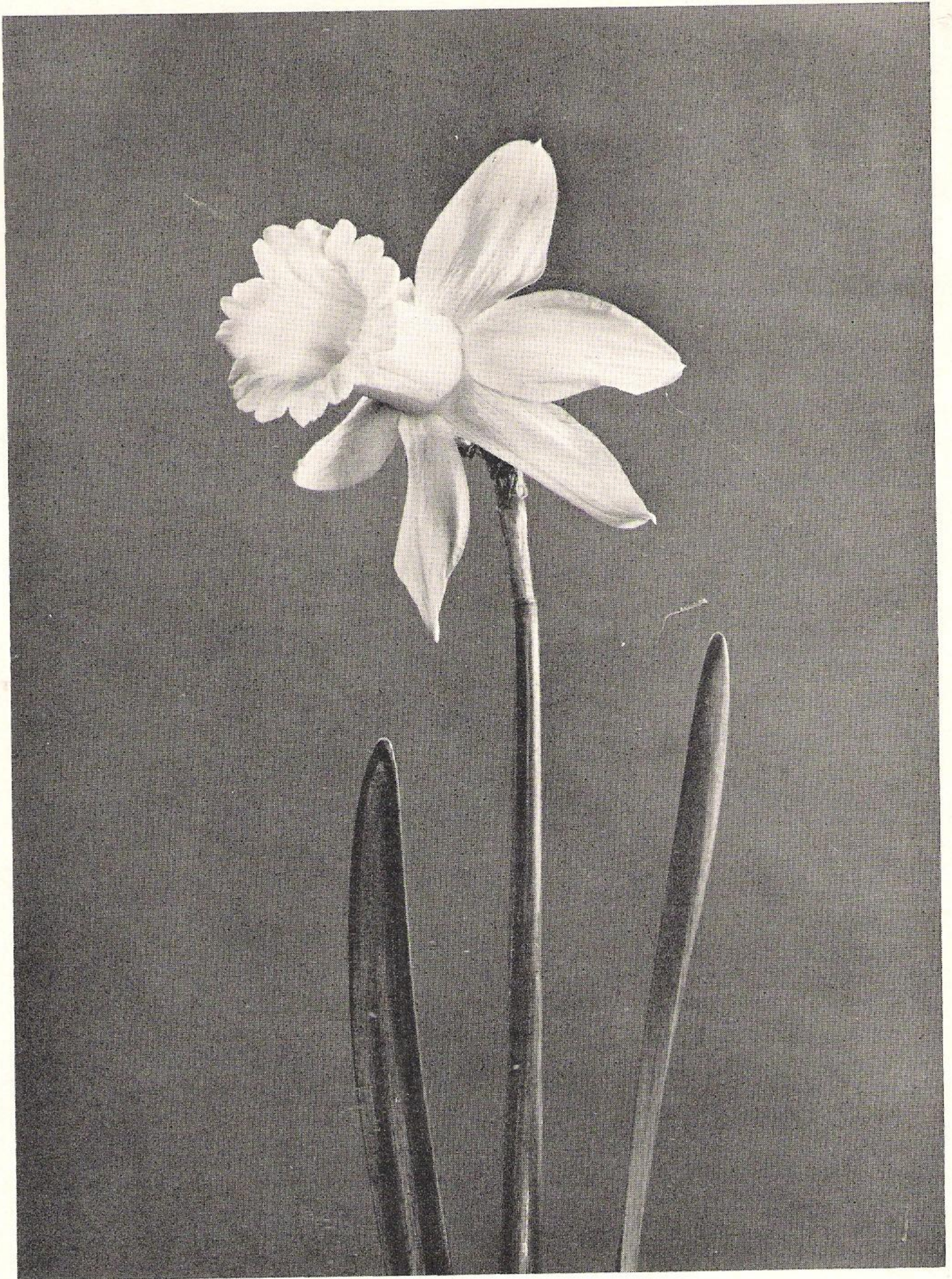


PLATE 54

PEEPING TOM
Cyclamineus (Div. 6a)

there although not too vigorously since forests now cover what was once cleared land. The old daffodils about these colonial plantations can truly be called "naturalized." Those at Leesylvania are of particular interest to the writer since they show no evidence of any virus infections. In contrast are the commercial plantings of this same variety in the countries where it is still produced on a considerable scale. Daffodil mosaic virus is quite prevalent in them, as it is in King Alfred and many of the other older daffodil cultivars. This same freedom from virus infection of certain stocks of Van Sion has been noted in parts of Italy where this cultivar has grown in woodland areas for many years. Certain commercial growers in other countries import stocks of that daffodil from time to time from Italy, to get a new start with virus-free bulbs.

FOREIGN BULB PRODUCTION

In considering daffodil bulb production in other parts of the world, mention can first be made of our neighbor, Canada. The Province of British Columbia raises a considerable quantity, Vancouver Island itself being reported as having 216 acres of daffodils in 1964.

Efforts to secure recent figures on daffodil bulb production in other countries met with varied success. In those lands where bulbs are big business, accurate figures are available. For example, the Ministry of Agriculture, Fisheries, and Food reports a total of 3,242 acres in England and Wales devoted to daffodil bulb production during 1964. In the same year growers in those countries grew cut daffodil blooms on 5,241 acres. Surprising as it may be to many gardeners those figures show England and Wales to be considerably ahead of their nearest competitor, the Netherlands. That country reported that in 1964 155,054,000 daffodil bulbs were grown on 2,923 acres of land. At the same time Dutch growers produced 75,000,000 cut daffodil blooms.

While the Irish daffodil breeders, both north and south, are famed for their remarkable daffodil introductions and their show successes at the London shows

of the Royal Horticultural Society, their production of novelties is confined to a rather limited acreage. Because of their value such bulbs are given almost individual care. A specialist firm in Ireland proper cultivates about 1½ acres of such bulbs, exclusive of unbloomed seedlings. According to the Ministry of Agriculture of that country, a total of about 40 acres is grown there, mostly for cut flowers. A considerable part of that acreage is in West Cork where early daffodils are grown for export to Northern Ireland and the United Kingdom. In Northern Ireland a prominent daffodil raiser there grows about 4½ acres, both of new seedlings and novelties.

Information furnished by the French Ministry of Agriculture indicates most of that country's narcissus production is in southern France in the Var Department in the region of Ollioules. There the French growers devote approximately 173 acres to narcissus. Leading all others in the number of bulbs produced is Paper White Grandiflora, a form of *Narcissus tazetta* L., subspecies *papyraceus* (Ker-Gawler) Baker. A companion to this is another tazetta, Grand Soleil d'Or, but grown in lesser numbers. Two other cultivars, Fortune and King Alfred, complete the story in France.

To furnish a figure for the 1964 narcissus production in Italy, the Floricultural Experimental Station at San Remo consulted local growers and traders. In doing so they learned that 150 to 175 acres in Italy are devoted to producing the two tazettas, Paper White Grandiflora and Grand Soleil d'Or. The bulb production on that acreage is between 2,500,000 and 3,500,000. At the same time between 3,000,000 and 4,000,000 cut blooms are produced for commercial purposes.

Australia is known for the efforts of its daffodil breeders who have been quite successful. The Director of the Victorian Department of Agriculture was only able to give a rough estimate of daffodil production in the State of Victoria, the figure being about 6,000,000 bulbs annually from approximately 300 acres. At the same time flower sales

amount to about 20,000,000 stems per annum. A further estimate suggests that the total Australian production may be double that of Victoria.

While both Tasmania and New Zealand are known to grow narcissus, no one was willing to venture even a rough guess as to the acreage or production figures. Apparently much of the daffodil activity in those islands is carried on by amateur growers.

PRODUCTION AFTER WORLD WAR II

World War II, of course, stopped all European bulb shipments to the Americas, but soon after the end of hostilities they began again.

Unfortunately, the war had created problems for the bulb growers. Their effective pest control program had been seriously disrupted, both through loss or destruction of equipment and through curtailment of pest control chemicals. Because of this some bulb importations arriving at United States ports from Europe had to be treated or refused entry. These pest difficulties were of course costly, both to the European shipper and to the United States buyer. Finally, to help solve their problem the very progressive Dutch bulb exporters' association and the Netherlands Ministry of Agriculture decided to invite representatives of the Plant Quarantine Division of the United States Department of Agriculture to join with representatives of the Netherlands Plant Protection Service in the inspection of bulbs before export. A formal agreement was negotiated outlining the duties and responsibilities of the parties concerned and the work began in the summer of 1951. To cover the cost the exporters deposited the necessary funds with the United States Department of Agriculture.

The agreement has been renewed in each of the succeeding years and the accomplishments of the arrangement have met with the approval of a majority of the United States importers. At the same time this country has gained in plant quarantine protection.

As the success of the bulb inspection in the land of origin became known,

bulb shippers in other countries entered into similar agreements for United States bulb inspection before export, in the following order: Belgium, 1952; France, 1954; Italy, 1958; Federal Republic of Germany, 1959; and the Republic of South Africa, 1965.

BULB INSPECTION

Diagnosing the visible symptoms of ailing daffodils in the garden and the simpler methods of treatment which are within the capacity of most gardeners are discussed in Chapters 7 and 8. Government procedures in detecting and treating these and other conditions which may be found in dry bulbs imported from foreign growers often involve equipment and material not readily available to home gardeners. Nevertheless, a brief description of the methods of detection and treatment of pests and diseases used by the Federal Plant Quarantine inspectors should help to create confidence in the health of imported bulbs.

Bulbs are examined by United States inspectors working in collaboration with their counterparts in the countries just named. The men of the several countries are well versed in bulb production practices and know the pests attacking bulbs in each producing area. Those pests usually encountered in the inspection of daffodil bulbs are the narcissus bulb fly, the bulb and stem nematode, the bulb scale mite, and basal rot. It is gratifying to note that modern control methods in use since World War II have reduced the incidence of these bulb troubles. The growers of the various countries and the plant protection officials are to be congratulated on their accomplishments. The same can also be said of the officials and growers in the United States who have likewise made great strides in the production of clean bulbs.

The life cycle of the narcissus fly is described at length in Chapter 7, but, in brief, the eggs are deposited on the leaf bases of the plant in late spring. When the larvae emerge from the eggs they move downward usually following the outside of the bulb until they reach its

basal plate. They penetrate it, gradually working upward in the bulb as they feed and grow. In late autumn the maggot has attained full size and has nearly destroyed the heart of the bulb. The winter is passed in an inactive state in the hollowed bulb. In early spring it leaves the bulb, moves upward nearly to the soil surface, and pupates. With the coming of late spring the fully grown fly bursts the hardened pupal case and emerges to begin the cycle again.

Evidence of infestation can usually be detected by a depression or hole made by the young larva when it entered the bulb's basal plate. Exploration of such depressions or holes with a knife point shows whether it is merely a normal depression in the plate or is a hole penetrating into the bulb. A hole calls for a surgical followup and may save the bulb if done with care early in the summer. In the late summer or early fall, infested bulbs have developed another symptom, a softness of the bulb when it is firmly squeezed. Daffodil fanciers and other gardeners should check their bulbs before planting to eliminate every bulb fly larva and thus prevent the establishment of an infestation that may later require a great deal of control work each year. Commercial growers can, of course, eliminate this pest from infested bulbs either by fumigation or a hot water treatment. To prevent infestation they usually use a chemical dip.

The bulb scale mite is quite a different pest. While it cannot be seen by the unaided eye, its damage can be detected without magnification. It usually enters the bulb at the neck, working its way downward between the fleshy scales. To find them early in the season, the inspector forces the fleshy scales of the neck apart to look for the telltale brown scars resulting when the mites pierce the surface cells to feed. If the scarring is present a hand lens or a microscope is needed to confirm the presence of the mites. A second method of examination is to cut across the tip of the bulb nose, just below the point where the old leaves separate from the bulb. A quick examination of the exposed white scale flesh will show brown spots at points where

the bulb scales touch each other.

In a mild climate and under glass, bulb scale mites can cause extensive bulb, foliage, and flower injury. Fumigation with methyl bromide or the hot water treatment will eliminate the pests. Unfortunately, few amateurs are equipped to do either. Whenever the mite is found during daffodil inspection in the foreign countries mentioned earlier, a treatment is required before the bulbs are allowed to be shipped to the United States.

Today the bulb and stem nematode is under good control in the lands producing narcissus bulbs for export to this country. It is greatly feared because of its destructiveness and because of the difficulty of eliminating it from soil that has become infested. In view of its importance as a pest, stern measures have been taken against it. As most daffodil growers know, the treatment is immersion in water at a temperature of 110 to 111.5° F. for three to four hours, the latter time being preferred for more certain results. If the treatment is given while the bulbs are still dormant little if any injury results. In fact, many growers have found that the treatment apparently stimulates bulb increase.

The foregoing covers three damaging animal pests of daffodil bulbs. To them should be added one very destructive fungus organism, *Fusarium oxysporum* Schlecht., var. *narcissi* Snyder & Hansen. It causes the notorious "basal rot" of daffodils. The common name describes it well. The fungus remains in the soil for several years after its introduction, even though daffodils may not be in the ground for an extended time. It lives on whatever organic material may be in the earth.

Div. 1 daffodils seem to be the most susceptible although certain cultivars in Divs. 2 and 3 are also attacked. The same is true of daffodils in Div. 4 which are sports from daffodils in Divs. 1, 2, 3. Losses from basal rot are higher in warmer climates. Certain chemical dips have been shown to reduce losses significantly, but it is hoped breeding for resistance may eventually reduce the disease problem.

Bulbs in an advanced stage of infection are soft when squeezed. However, early in the season infections may only be found by a careful examination of the bulb base and the point where the bulb scales join the basal plate. In an early infection a careful scraping of the plate with a knife will show parts of it to be spongy and brown. At the same time, by carefully lifting the brown bulb scales at the point of union with the plate, the fleshy bulb scales will be uncovered. If basal rot is present the fleshy scales will be brown instead of white. In the fall the young roots of a sound bulb will begin to push out at the point where the plate and the fleshy bulb scales join. At that time any bulb on which that swelling is not taking place should be carefully examined since one of the first things basal rot does is to kill the young roots even before they start emerging.

No bulbs showing any signs of infection should be planted in the daffodil beds, although some gardeners have been able, by careful surgery, to remove an early infected spot and save the bulb. Any such bulbs should be planted away from the sound bulbs, in a place where water drainage from them will not go into the regular daffodil beds.

HANDLING BULBS IN UNITED STATES QUARANTINE STATIONS

The commercial lots of bulbs from the countries where United States inspectors work are not fumigated or otherwise treated upon arrival in this country. This is not true of bulbs brought in by parcel post under the green and yellow address labels issued with the permit by the Plant Quarantine Division. Those labels bring the parcels to a designated special inspection station where the bulbs are checked for basal rot and a possible nematode infestation. Then they are fumigated to kill narcissus fly larvae, bulb scale mites, or certain other lesser animal organisms. If nematodes are found and it appears the bulbs can be saved, they are given the hot water treatment before being forwarded to the permittee. Dead bulbs are destroyed.

This system of quarantine handling is especially valuable for the daffodil fancier. He is frequently buying expensive novelties and they usually arrive by parcel post from specialized growers in foreign countries, including those countries where the United States does no bulb inspection. The inspection forces of the foreign governments do a fine job when examining the bulbs for export, but there are times when an incipient infestation or infection will not be detectable that early in the season. However, a few weeks in a warm mailbag in the hold of a ship serves as an excellent incubation period during which the infestations and infections can become quite evident.

Inspection and treatment at the inspection stations are done with as little delay as possible. In nearly all cases parcels arriving on one day, go on their way the next, except those arriving on Friday; these may have to be held over until Monday. Those found to be carrying nematodes will be detained a little longer because of the necessary hot water treatment. When inspections are made and treatments are given, great care is used to assure there is no mix-up of labels, a thing of real importance to daffodil specialists.

It should be noted that daffodil plantings, in countries where the Plant Quarantine Division carries on inspection of dry bulbs, receive a spring field inspection. This work is done in collaboration with the inspection services of those countries. This cooperative effort has served to reduce the incidence of pests.

COMMERCIAL CULTIVATION

The cultivation of daffodils for the production of bulbs varies considerably from country to country. The famed Dutch beds have been in vogue in the bulb fields of the Netherlands for many years. They are of a width that permits a worker to reach the center from each side for weeding, flower picking, and other necessary work. In the past a tremendous amount of the bulb work in Holland was hand work, including the "digging" of the soil to prepare it, the opening of the bulb bed, the placing

of the bulbs, the covering of the bed with earth from the next bed, the spraying of the plants, the roguing of the diseased plants and stray cultivars, the removal of the flowers, and finally the lifting of the bulbs. In Holland there have, of course, been variations in the procedure just outlined, but it has been the general way of doing the job.

In recent years some of the growers of Holland have removed the hedges that have for so many years served as wind-breaks. That has been done to make it possible to mechanize some of the work. With that change have gone the old Dutch beds, to be replaced by long rows stretching the length of the fields. Small garden tractors and other mechanical contrivances have helped to eliminate some of the back-breaking hand labor.

In the Pacific Northwest and other bulb areas of North America, the Dutch bed method was used in the early years and of course required much hand labor. The bed method was soon superseded by the row method, bulbs being planted in furrows opened by a horse-drawn plow. Later, tractors replaced the horse, and so the Dutch bed method was retired. Placing the bulbs in the furrows was a costly procedure if done by hand. Therefore, the larger growers in the Pacific Northwest have built planting machines capable of planting two or even four rows at a time.

BULB SIZES

The bulbs planted by the commercial grower are of different sizes and shapes. Information on bulb structure and growth will help to explain this. A bulb is considered by botanists to be an enlarged underground growth bud. The basal plate is designated as the stem and the scales the enlarged and thickened leaf bases. When the daffodil bulb reaches a certain size, small buds appear in the axils of one or more of the bulb scales, just as buds develop in the leaf axils of a rose branch. The bud continues its growth until it finally separates from the old bulb and becomes a bulb of its own. When it separates it takes with it a portion of the scales of the old

bulb and a part of the basal plate or stem.

The various sizes of daffodil bulbs known to daffodil growers are: 1) splits, slabs, offsets, or chips; 2) rounds; 3) double-noses; 4) wall-sided bulbs; and 5) broody or mother bulbs. A true mother bulb is one that has at least two offsets ready to be removed from the parent. A wall-sided bulb (a term used in the British Isles) is the parent bulb from which the easily removed offsets have been removed, leaving flat sides on the parent. The term is also occasionally used for a large offset with a flat side. This kind of bulb should produce large rounds or even double-noses in its second season. A double-nosed bulb is one capable of producing two flowering stems and usually results from a year's growth of a round. The double-nose is usually the bulb sold in the trade. After a year or two of growth it is a mother bulb.

A round bulb is just that; round in shape with no offsets. In nearly all cases round bulbs should produce one flower stem and with a year's growth should be a double-nose. Slabs, as they are usually called in the Pacific Northwest, are the offsets or pieces that have separated from the mother bulbs, either naturally or by hand. An occasional large slab may flower the first spring after planting and many of them will flower in the second spring. When dug in the second summer they will be rounds of varying sizes.

A commercial grower with a good knowledge of the bulb kinds just mentioned will plant them separately and will know within reasonable limits the sizes he will lift in one, two, or three years. When harvesting his mother bulbs and preparing them for replanting he keeps one thing in mind. In separating the offsets he does not force those still tightly attached to the mother. To do so may damage the basal plate of either the offset or the mother bulb. That damaged part is a fertile spot for the beginning of a fungal infection. He knows an offset is ready for removal when it and the mother bulb are completely separated by a dry brown scale. If there is

white scale flesh on the side where they are close to each other, they are not ready for separation.

BULB HARVESTING

In the early days daffodil bulbs were dug (lifted) by hand. According to *The Flower Bulb Industry* (Charles J. Gould, Washington Agricultural Experiment Station, Circular 318, October, 1957) it requires 12 man-days of hand labor to dig an acre of daffodil bulbs but an average of only four or five days by machine methods. Many of the machine diggers used in the Pacific Northwest have been designed and built by the growers. Usually they are modified potato diggers. After being lifted out of the ground, the bulbs pass through the machine by various routes and land in trays which are stacked in the fields to dry.

When drying is finished the bulbs go to the sheds for cleaning, sorting, and packing for shipment. Cleaning in the Pacific Northwest is often accomplished by machines which are potato cleaners altered to make them suitable for use with daffodils. Much of the sorting or grading is done by Dutch-type machines, developed in the Netherlands through many years of practical experience. Shipments of daffodil bulbs are usually made in slatted wooden crates, the spaces between the slats providing air circulation to prevent an accumulation of moisture and premature rooting.

In the Netherlands, because of the smallness of the bulb fields, mechanical diggers are not too practical, so much of the daffodil harvest is still done by hand labor. As in the Pacific Northwest, the filled bulb trays are stacked in the fields to dry. However, the Dutch grower is less fortunate on the average than his counterpart in the United States. His weather is frequently less favorable for drying and he may finally be forced to move the bulbs into packing sheds for artificial drying if he is to meet shipping deadlines.

Growers in the British Isles handle their bulbs in much the same manner as do the Dutch and United States growers, and they are also at the mercy of occa-

sional unpredictable summer weather, causing difficulties in lifting and drying the bulbs.

BULB MERCHANDISING

Daffodil bulbs, as well as other bulbs, are sold at the corner drugstore, the neighborhood supermarket, the dime store, the garden department of the big department store, the local plant nursery, the large general mail-order house, the mail-order concern dealing mainly in horticultural items, the wholesaler who supplies the retailers just mentioned, and the grower who sells his product to the wholesaler.

Prior to World War II many of the bulbs imported into the United States came in for forcing purposes or for use in planting on large estates and in parks. With the resumption of trade after the end of the war a new trend developed. Instead of arriving in large wooden cases, they began to come packed in small, gaily colored cartons, 5 or 10 or 15 bulbs to the box. These were the bulbs that began to appear in the various stores that would not have considered handling bulbs in bulk. And these were the bulbs that began to go home to suburbia, a box or two at a time, to make bright spots of color the next spring in a newly established real estate subdivision quite devoid of plant life following the enthusiastic efforts of the bulldozer. At first this merchandising method began in a small way, but it has grown vigorously in the years since its start.

Another bulb merchandising plan used by certain mail-order horticultural firms begins with the mailing of colorful catalogs to prospective buyers. Their orders to the firm are transmitted to a large bulb-packing firm in the Netherlands where each order is separately packaged. The address label, furnished with the order, goes on the package, it is weighed, and a United States postage meter sticker is applied to cover parcel post movement from the United States port of entry to the buyer. This and numerous other packages go into large shipping cartons which, in turn, go into the cargo hold of a ship and soon cross

the Atlantic. Upon arrival at the United States port, the cartons are delivered to the post office where the individual packages go into the parcel post for delivery.

But long before the bulb-shipping time has arrived, energetic English-speaking salesmen from the Netherlands and certain of the other bulb-producing countries arrive in the United States and other parts of the world to take orders. Competition is spirited. The big wholesalers in this country receive huge quantities of bulbs which are in turn sold to retailers. Some of the Netherlands firms have even set up their own branches in the United States, frequently run by members of the family who have migrated to the New World.

Daffodil growers in the British Isles and Antipodes send out attractive catalogs to wholesalers and to garden enthusiasts in this and other temperate parts of the world. Their orders are usually delivered by parcel post. Only occasionally do these producers of novelty daffodils travel outside of their own countries to solicit business.

The catalogs of European specialists are usually ready in April and May and should be requested at that time as the first step in placing an order abroad. Dealers in Australia and New Zealand issue their catalogs in October and November and bulbs are shipped during our winter. Handling these bulbs is discussed in Chapter 2. Overseas correspondence should always be conducted by air mail.

DAFFODIL SHOWS AND AWARDS

The leading producers of novelties rarely fail to attend the principal daffodil shows such as those staged by the Royal Horticultural Society in London. Competition at those shows is keen and a major award is worth a great deal as advertising.

At those same shows the novelties are judged for possible awards as exhibition cultivars. The winning of an Award of Merit (A.M.) or a First Class Certificate (F.C.C.) is an important accomplishment and can usually be depended upon to indicate the merit of a novelty. The awards to be won by a daffodil cul-

tivar are listed in the *Classified List and International Register of Daffodil Names* published by the Royal Horticultural Society.

To designate limited awards the Society uses certain code letters: A.M. (e) and F.C.C. (e) are given to cultivars in recognition of their value as "exhibition" flowers; A.M. (g) and F.C.C. (g) are given for excellence in "garden decoration."

Across the North Sea in the Netherlands, the Royal General Bulb Growers' Society holds exhibitions in its Haarlem headquarters. Awards of Merit and First Class Certificates are given at those shows. Their awards are shown in the *Classified List* as "A.M., Haarlem" and "F.C.C., Haarlem," followed by the year the award was made. Both Societies occasionally make other awards. These are listed and explained in the introduction to the *Classified List* but are of less interest to non-commercial daffodil growers.

BULB SOURCES

Gardeners have two main sources of daffodil bulbs, local dealers and the specialists who are usually at distant places or even in a foreign country. The local sources of bulbs generally offer the daffodil cultivars of lesser cost. However, many of those cultivars are a good investment for the person just beginning the hobby of growing daffodils. By referring to other parts of this Handbook, the inexperienced gardener will find comments on the many different daffodils. Those comments will serve to guide him in making his choice from the bulbs offered in nearby stores.

By the time he has chosen and grown some of the less expensive cultivars, the gardener's enthusiasm will probably cause him to seek sources of daffodils not available locally. In Appendix C the interested gardener will find a list of retail dealers offering a wide variety of daffodils, both in this country and abroad. However, he will not find the name of a member of the American Daffodil Society living in his community who might be able to help out with a few surplus bulbs as a starter. By joining the So-

ciety, the gardener will be able to determine whether he has any daffodil-growing neighbors and he will receive the organization's publications.

Should the gardener decide to purchase bulbs from an out-of-state source he will have no difficulties. The shipper is required to be informed on the regulations governing the interstate shipment of bulbs. If the gardener decides to import, there is a simple requirement to be met. A permit must be secured authorizing the entry of the bulbs. To get it, write to the Plant Quarantine Division, 209 River Street, Hoboken, New Jersey 07030, asking for a permit to import narcissus bulbs. Be sure to state: (1) the country or countries of origin; 2) the number of parcels expected; and 3) the expected means of

transportation. Also mention whether other importations are expected during the year. Experience has shown that parcel post transportation of foreign bulbs lessens entry problems when they arrive at U. S. ports.

To avoid delays, apply for the permit three or four weeks before the order is to be sent to the foreign shipper. If parcel post is to be the means of transportation, green and yellow mailing labels will be received with your permit. Send the mailing labels to the shipper with your order, but retain the permit itself. When sending the order stress to the shipper the need for pest-free and soil-free bulbs. Infested or diseased bulbs or soil-contaminated bulbs will experience difficulties at the time of entry. Cleaning and treatment will be necessary.

—22— Breeding by Amateurs

An amateur daffodil breeder may be defined as one who engages in the pursuit primarily for pleasure rather than as a business. His pleasure may consist of observing for himself the various stages of progress in developing seed pod, growing seedling, enlarging bulb, and, eventually, in studying the first flower to see how it reflects the characteristics of its parents. These pleasures are recommended to all daffodil growers, to increase their appreciation for the plant, whether or not they are tempted to make daffodil breeding a major interest.

Usually, however, these pleasures are incidental, and the motivation is the desire to produce new varieties "of one's own" that are better than those now available, or at least different from them in some way. As new varieties are being produced in increasing numbers in various parts of the world, this becomes more difficult each year, and the serious amateur may find that deciding on a suitable program is one of his most difficult tasks.

Anyone interested in daffodil breeding beyond the observation of the life-history of a batch of seed should know something of the elements of genetics and plant breeding. Daffodil breeding is complicated by heteroploidy and variations in chromosome numbers in species. Knowing why certain crosses are likely to fail will save many disappointments. One very helpful publication for beginners is *A Handbook on Breeding Ornamental Plants*, published by Brooklyn Botanic Garden as Vol. 15, No. 2 of its *Plants & Gardens*, August, 1959 and still in print for one dollar. Your public library may have others. Specific information concerning daffodils is most likely to be found in the publications of the American Daffodil Society and in the

Daffodil and Tulip Year Books of the Royal Horticultural Society. Much of this information has been collected and codified in the Daffodil Data Bank of the American Daffodil Society, a project utilizing an electric computer to store and make available detailed information on daffodil cultivars and their family trees. The published compilation of 1965 lists more than 3,000 cultivars and many species and wild forms, giving available data on parent varieties, breeder, color, season, height, chromosome count, fertility, and date of registration.

Pollinating daffodils is very simple. Daffodils are bisexual, or "perfect," flowers; each contains both female and male reproductive organs. The female germ cells are formed in the ovary, which is below the perianth. From this rises a slender column called the style, which terminates in a faintly three-lobed extension called the stigma. Ovary, style, and stigma together are called the pistil. The male organ is called the stamen, and consists of a filament supporting the anther, which bears the pollen grains. The relative lengths of pistil and stamens vary in different species, and in some cases in blooms of the same species. In most daffodils the arrangement is symmetrical, with the six stamens surrounding the pistil rising straight from the ovary, but in the bulbocodium group the curved pistil and stamens are asymmetrically arranged.

Pollination consists of applying the pollen from the bloom selected as male (pollen) parent to the stigma of the one chosen as female (seed) parent. If conditions are favorable, the pollen grains germinate and pollen tubes grow down the style to the ovary, where the germ cells of male and female parents unite and seed develop. Experienced breed-

ers differ considerably in their methods of pollination, timing, and precautions taken to prevent accidental pollination instead of the cross planned. The methods described here are recommended for beginners who wish to be reasonably certain that the seed they collect have come from the cross planned.

The simplest cross is that between two varieties blooming within a day or so of each other. Select the bloom to be used as seed parent before it is fully open. At this time the pollen sacs (anthers) will not have opened to release the pollen. Using tweezers carefully remove these anthers to prevent self-fertilization. If the bloom selected as pollen parent is completely open and the pollen is visible on the anthers, remove an anther with the tweezers and brush the pollen onto the stigma of the seed parent. If the stigma appears dry and the pollen does not adhere, wait a day or more and repeat the process. The stigma should be slightly moist or sticky for best results. Use as much pollen as will adhere; this helps to ensure a good yield of seed. Much remains to be learned about conditions favorable and unfavorable to the germination of the pollen grains on the stigma, and it is a sensible precaution to repeat pollination one or more times. It seems to pay.

Mark the pollinated bloom by attaching a small string tag with the name of the seed parent, the sign "x," the name of the pollen parent, and the date or dates pollinated, using a soft pencil.

This simple method may be varied in many ways. Pollen may be transferred on a small brush (slightly moistened), on a glass rod (rubbed against wool to make the pollen adhere), or even on the point of a pencil. Sometimes, especially with small species, it is easier to work with the entire bloom than to attempt to remove an anther or transfer pollen to a brush or other carrier. Pollen may be stored in a desiccator, or frozen, but the beginner is advised to start with fresh pollen. Some breeders moisten the stigma with honey or sugar solutions to secure better pollen adhesion. Records may be much more elaborate, with age of blooms, time of day, temperature,

and atmospheric conditions noted, in which case a notebook would be used, each cross numbered, and only the cross number used on the string tag. A few breeders cover the blooms of the seed parent to reduce the chances of insect or wind pollination, but this practice has never been generally followed in daffodil breeding.

Some pollinated blooms soon show that they are failing to produce seed. They shrivel completely, ovary and all. In other cases the ovary may remain green and expand for several weeks, only to turn yellow and then brown and suddenly collapse. Pods remaining green a month after pollination are more likely to complete the maturing of the seed, and these should be watched closely lest the pod crack open and spill the precious seed. The danger can be averted by enclosing the pods in squares cut from nylon stockings and held in place by short lengths of thin wire ("Twistems"). Thus protected, the seed may be collected after the pods open. If this method is not used, the ripening pod may be picked with a few inches of stem when it begins to turn yellowish at the tip, and allowed to complete ripening in an open container. When the withered bloom falls away the seed pod will soon open.

The number of seed to the pod may vary from one to 50 or more. Very small lots of seed or a high proportion of failures may indicate that the varieties chosen as parents are triploids, whose odd sets of chromosomes do not pair in the normal manner to form fertile germ cells or pollen grains. While chromosome counts are not available for all varieties, most of the larger modern varieties are believed to be tetraploids, except in Divs. 5-8. These, resulting from crosses between diploid species and tetraploid varieties, are usually triploids. In Div. 8 there is a further complication due to the fact that tazetta species have 20 or 22 chromosomes instead of the 14 of most of the other *Narcissus* species and wild forms. As triploids do occasionally produce fertile pollen and ovules, leading to fertile tetraploid plants and new combinations of characteristics, there is

much interest among amateurs in attempting crosses with them. In the case of triandrus and jonquilla hybrids there seems to be a sterility factor in addition to the obstacle of triploidy, making the discovery or development of fertile varieties in these divisions particularly desirable. First crosses between *N. triandrus* or *N. jonquilla* and tetraploid varieties are usually easily made, however, with good quantities of seed formed.

Environmental conditions also affect the success of pollinations, but opinions vary as to what conditions of heat, cold, and humidity are most favorable. It is said that pollen is usually more sensitive to unfavorable influences than the stigma.

Seed may be planted immediately or held until fall, depending on the attention to be given to it. Unless it can be protected from summer heat and danger of drying, it is probably safer kept in envelopes and planted in the fall.

The seed may be planted in rows in a seed bed or in pots, boxes, or other containers. A light, well-drained soil mixture is suitable, and the seed should be planted from half an inch to an inch deep. For small lots of seed, clay or plastic pots sunk in a coldframe are convenient; covering the rim of the pot reduces the danger of breakage. If separate containers are not provided for the different lots of seed, there may be some difficulty keeping the lots in order when the small bulbs are dug two or three years later. By this time they may be several inches below the surface.

The first shoots appear in early spring, and these should be protected from sudden severe drops in temperature. If a coldframe is used, it should be closed at such times. Mulching with a light material such as buckwheat hulls will help prevent heaving. The first shoots—and only one leaf appears the first year—should be kept growing as long as possible. A diluted liquid fertilizer may be given.

At the end of the second year the small bulbs are usually dug and planted in rows where they will remain until they bloom, two or more years later. Crosses from species or miniatures may

be left three or more years if they are not crowded. It is advisable to replant all small bulbs without delay.

In the fourth or fifth year the first blooms will probably appear. The best ones should be marked and brief descriptions entered in the records. Any seedling bloom to be entered in a daffodil show must be given an identifying number which should be retained by the bulb or bulbs until the seedling is registered or discarded. Notes on disappointing blooms are often made also; sometimes a seedling will improve after the first blooming. After two or three years of observation it will usually be possible to discard a large proportion of the seedling bulbs, although this may mean merely transferring them to naturalized plantings or cutting rows rather than keeping them identified in nursery rows.

The amateur breeder who can exhibit his seedling blooms in daffodil shows is fortunate, whether or not the blooms win ribbons or awards. It is helpful to have the opinion of qualified judges and the reaction of the public. The breeder will remember, however, that show bench judging is based on only a single bloom; the value of the cultivar will depend also on its vigor and garden behavior.

Seedlings that are considered worthy of introduction should be registered while all the stock is still in the hands of the originator. (This term is used by the American Daffodil Society to denote the person who first blooms a seedling, regardless of who made the cross or planted the seed.) The Royal Horticultural Society, London, is International Registration Authority for narcissus, and the American Daffodil Society the American representative. (See Chap. 24.)

What are some suitable aims for the amateur breeder? When we consider that most of the development of modern daffodils has been the result of breeding carried out in climates very different from those of the original species, and different from those of most parts of the United States, it is surprising that there are so many varieties that succeed as well as they do here. Wherever the

full range of types is not equally successful the breeder has two first choices: to specialize in types that do succeed in the area, or to attempt to breed varieties that will extend the range. Thus in southern California one amateur breeder is working with the tender tazettas that have been so little used heretofore in breeding, while another is making crosses with poeticus varieties in the hope of producing one that will thrive in that hot climate. Breeding for better resistance to basal rot may seem too technical for amateurs, but this problem is not being specifically attacked at present by the trade or by government agencies; some amateurs may wish to tackle it. To some extent any breeding done where the disease is a serious problem may help.

Breeding projects for Divs. 1-3 will depend on the breeder's personal predilections, his optimism, and his available space. What are the chances of producing something distinctive and different from all the thousands of varieties already being grown in these classes? One in a thousand? Less? In certain areas the chances may be better; reversed bicolors, pinks, yellow-reds with strong color in the perianth, for instance. Even in these areas the amateur will be in direct competition with commercial growers who are working on a large scale, so important in making objective evaluations of new cultivars.

There are better opportunities in Divs. 4-8, where special genetic factors have limited efforts in the past. The recent interest in double daffodils has been spurred by the discovery of a fertile variety, Falaise. Some other double varieties that have been reported to set seed are: Gay Time, Mrs. Wm. Copeland, Pink Chiffon, Riotous, Snowball, and Windblown. The Thompson Prize has been established in the American Daffodil Society to encourage the production of a new fragrant double white daffodil similar to *N. poeticus* 'Flore Pleno' (commonly known as *Albus Plenus Odoratus*), but blooming more freely.

Triandrus hybrids have generally been considered completely sterile, but

several amateur growers have reported occasional seed, usually open-pollinated. One seedling from *Thalia* × Evening produced seed which give promise of third-generation triandrus hybrids. Several years ago Grant Mitsch introduced Honey Bells as a fertile 5a, and more recently Harmony Bells and Silver Bells have been added to the list of available parents in this class. Much greater diversity in triandrus hybrids seems to be in the offing, and amateur breeders working with these cultivars will not be far behind the originators of the cultivars. Backcrosses with forms of *N. triandrus* might produce strains having the distinctive charm of the wild forms but greater vigor and permanence. Crosses with varieties in Divs. 1-3 will be expected to show the triandrus influence more subtly. Combinations with *N. cyclamineus*, with *N. jonquilla* or related species, or with poeticus cultivars could produce welcome variations in form and color. Although the new fertile triandrus hybrids are of particular interest now, crosses are still being made between *N. triandrus* forms, especially *triandrus concolor* and *triandrus loiseleurii*, and standard or miniature cultivars. Pink or red cups would be very welcome.

Until the early 1940's there was little variation in cyclamineus hybrids, and little interest in them. A single cross made by an amateur changed all this. In 1936 Cyril F. Coleman crossed Mitylene, a pale 2b, and *N. cyclamineus*. When Charity May, Jenny, and Dove Wings, progeny of this cross, appeared they were greeted with wonder and delight, and a new era began for cyclamineus hybrids. This cross inspired not only others with relatively short-cupped varieties in pale colors, but crosses with the brightest of yellow-red varieties. The new introductions in turn have been used as parents, bringing further variation in form and color, until the danger now is that the distinctive characteristics of the species *N. cyclamineus* may be lost.

The 6b Beryl was for many years the only cultivar with cup short enough to qualify it for that classification. Crosses

between Beryl and short-cupped or poeticus varieties have been made, but there is room for more.

Jonquil hybrids appear to be as prone to sterility as triandrus hybrids, but even here a new day seems to be dawning. Several years ago Grant Mitsch discovered a seed pod on one of his seedling jonquil hybrids. This cultivar, since named Quick Step, has continued to produce seed and some of its progeny, too, have proved fertile, so that before long we may see cultivars combining in various ways the characteristics of *jonquilla* and *triandrus* or *cyclamineus*, combinations heretofore possible only in first-generation crosses between the species themselves. Meanwhile amateurs continue to watch their jonquil hybrids for open-pollinated seed, and to make pollinations in hope of the rare seed. Kidling and Trevithian have each produced seed in different areas in recent years, and seedlings having Chérie and White Wedgwood as pollen parents have produced blooms in which characteristics of the pollen parents can be recognized. (With such unusual crosses the breeder can never feel entirely sure until the bloom appears.)

The species *N. jonquilla* continues to be used in breeding first generation jonquil hybrids, with reverse bicolors, pinks, and red-cups perhaps the most hoped-for results. Fragrance is an extra dividend to be desired.

In Div. 8 also recent developments have changed the situation. The poetaz variety Matador, introduced by Oregon Bulb Farms, appears to be fully fertile, and some promising crosses are being made with it. Perhaps a golden version of the popular triandrus-tazetta variety Silver Chimes will result. Aspasia, Early Perfection, Elvira, and Orange Wonder have been reported to give open-pollinated seed for an amateur grower in southern Illinois; as with other usually sterile types, any seed collected is of interest.

In the South and southern California tender tazetta varieties and forms may be used in new combinations.

The principal use of poeticus varie-

ties in breeding nowadays seems to be in crosses with varieties of other divisions, especially Divs. 3 and 4. New poeticus varieties that would be suitable for warmer climates are to be desired, as are more early-blooming varieties. Combinations of poeticus characteristics and those of triandrus, cyclamineus, and jonquilla have not been very extensively exploited.

In Div. 10 *N. cyclamineus*, *N. jonquilla*, and *N. triandrus* in its various forms are the wild forms most often used in breeding, except for the production of miniature varieties. All of these combine easily with tetraploid varieties of Divs. 1-3, and usually produce triploid varieties that are sturdy and pleasing, even if not distinctive enough for registration. Crosses using the small members of the jonquil group, such as *N. calcicola* and *N. watieri*, are less dependable, often producing seed with abortive embryos.

Several amateurs have reported crosses with *N. bulbocodium* forms, or crosses with split-corona varieties, but it is too early to know whether there will be much interest in these unconventional types.

The breeding of miniature varieties is discussed in Chapter 23, written by Alec Gray, who has been responsible for most of the miniature varieties now available. This area is particularly suitable for amateurs to work in, as the smaller bulbs do not lend themselves well to the mechanized operations of large-scale growers. Breeders interested in the smaller daffodils will wish to take advantage of every opportunity to use any of the smaller species in combination with diploid varieties of small to medium size, or with each other. The progeny will not be as variable as that of tetraploid varieties, but there are still possibilities of producing small flowers of distinctive form and color. Those not distinctive enough to merit registration may still be welcome to add diversity to the garden planting or the desk-top arrangement. They lengthen the daffodil season, too, as they include very early and very late types,

—23— Tomorrow's Miniature Daffodils

It seems almost presumptuous for someone in England to write on miniature daffodils in an American publication, for there can be no shadow of doubt the widespread enthusiasm for small daffodils in the United States puts to shame the efforts of the small band of British growers who are really interested in them. The great amount of work put in by the committee of the American Daffodil Society embodied in its report on miniature daffodils in February, 1963, is proof of this. If further proof were needed, there is the founding of the Roberta C. Watrous Award; we have nothing whatever resembling it in England.

I am presuming to write these notes, however, because I believe I am right in assuming that some of us over here have been growing and, in particular, hybridizing miniature daffodils rather longer than anyone in the States, so that in the course of time we may have gathered some little store of knowledge on the subject which we can, perhaps, pass on to our American friends to their advantage.

I believe it is true that most of the small daffodils thrive better in America than in England. This is really not surprising, since all of them are either species or hybrids not more than two generations removed from the wild, and, therefore, climatic conditions in the United States are much nearer those of their native lands than the humid, constantly changing English weather. In these circumstances, there is probably little that the American grower can learn from us regarding cultural methods. It will, I think, be more useful if I discuss where, in my opinion, advances in the production of new varieties are most needed and most likely to be achieved.

Let us take the bulbocodiums first. These are a delightful, justly loved group, but they present considerable room for improvement. Firstly, they are the least hardy section, and, secondly, several sorts are by no means free flowering under ordinary conditions. I think that little advance is likely to be made by crossing with other groups; with one or two exceptions everything that has been raised by outcrossing with other groups seems inferior in beauty to the species. I think that it is only by intercrossing within the group that we are likely to make progress.

Although not plentiful nor easily obtained, there are several vigorous and free-flowering forms of deep yellow bulbocodiums in cultivation—some from high elevations in the Atlas Mts.—which are much superior to the ordinary commercial strains of *conspicuus* (*N. bulbocodium* subsp. *vulgaris* var. *conspicuus*), *obesus* (*N. b.* subsp. *obesus*), and others. What is needed most in the bulbocodiums at the moment are some really vigorous white ones; all the present sorts lack both hardiness and constitution, although they are some of the most beautiful of all daffodils. There would seem to be no reason why, if enough crosses were made between the most vigorous and free-flowering yellow sorts and white ones, such as *foliosus* (*N. cantabricus* subsp. *cantabricus* var. *foliosus*) and *monophyllus* (*N. c.* subsp. *monophyllus*), white forms with good constitutions should not turn up. Even if they did not appear in the F₁ generation, they might well appear if these were selfed or backcrossed.

Bicolor bulbocodiums of good contrast are also very desirable and can certainly be produced. I have raised some in the past, but have lost them, alas!

Small *la*'s (yellow trumpets) need not concern us very long. There are not many in commerce at the moment—although there are more than the A.D.S. approved list indicates—but they are the easiest group to work with, largely because they are all entirely fertile and intercrossing can go on indefinitely. The best forms of *N. asturiensis* must be the basic material. By crossing these with some of the larger trumpets, either species or hybrids, and backcrossing if the progeny is too large, many lovely little plants can be produced in a few generations without difficulty. I, myself, have many exquisite little yellow trumpets far in advance of anything now available. It is just a question of propagation, for, on the whole, they do not increase very rapidly.

With bicolor trumpets, the problem is the same with the small daffodils as with the large ones: to obtain good contrast. In the approved list only three are mentioned: Bambi, a poor thing apart from its value for naturalizing; Rockery Beauty, which may thrive in America but seems to have died out here; and Little Beauty. This last is a charming flower, but there is certainly room for more than one good *lb*. They can be produced; I have one or two with better contrast than Little Beauty, but I have not managed to breed a smaller one. They are not easy to breed; crossing yellow and white trumpets generally results in a whole series of seedlings with colors right through from one parent to the other, including many charming pale shades, but very seldom any bicolors.

The situation regarding *lc*'s is peculiar. The A.D.S. list gives only five, all six or more inches tall except Snug, and outside my own collection there is none smaller in this country as far as I know. There are, I think, two reasons for this almost complete absence of really small white trumpets; one is that few people have worked with them; the other is that they are very slow to increase. They are not at all hard to produce; I have many tiny white trumpets among my seedlings, but I never seem to be able to work up any considerable stock of them.

When I first became interested in daffodils (I hate to remember how many years ago!), the large white trumpets were all considered to have poor constitutions; today this has been overcome and many are as robust as their yellow brothers. It seems, however, that the small *lc*'s are still more or less where the big ones were forty or more years ago.

The basic material of my small white trumpets has been the pale forms of *asturiensis*, Rockery White, and Rockery Gem. This last is a very sturdy plant, raised in Holland, of good form and substance, but just too large here to be considered a miniature.

Reversed dwarf trumpets are well within the range of the breeder; I have raised several, but so far they all have one fatal failing. In the large *ld*'s, such as Spellbinder, the flower opens yellow and the reversed coloring does not appear until the bloom matures. With my flowers, the opposite happens: they open strongly reversed, but the color of the perianth fades as the bloom ages until the reversed effect disappears altogether.

Divs. 2 and 3 present the breeders of dwarf daffodils with their greatest challenges: the production of small red and yellow or red and white cultivars. As things are at present, if we want flowers with red in the cup that can be classed as miniatures—or what we breeders like to call red—we have to go to the cyclamineus or jonquil hybrids. For my part, I have only raised one cultivar with red or orange in the cup which can strictly be regarded as a *2a*; this was Marionette which I have since lost but is still grown in America, I understand. In this plant, the orange red was confined to the rim of the corona, and, although the plant was very dwarf, the flowers were inclined to be on the large side.

Of course, the trouble is that if we cross ordinary red-cupped flowers with small self-yellow trumpets, we are halving the amount of red we are passing on to the offspring; the results almost always seem to be self-yellow or pale flowers, although sometimes one gets pale orange in the corona. It may

well be that we shall have to go right back to first crosses, to where breeders of the large flowers started a hundred years ago or more. By this I mean that we may have to use *poetarum* (*N. poeticus* subsp. *radiiflorus* var. *poetarum*), or something similar to get our color started. I have never used *poetarum*; I really have no idea why! The first results may very well be some miniature Will Scarletts, but at least that would be a beginning.

With the doubles, Div. 4, there is certainly virgin ground to be broken. What few doubles exist are all of unknown or chance origin. All lovers of daffodils know the spectacular results which have been achieved during the last few years, by the Richardsons, in particular, in breeding large doubles. There seems to be no reason at all why these beautiful flowers should not be scaled down to miniature proportions by using some of the very small species or hybrids for one parent. What more charming little flower is there than *Eystettensis* (*Syn. capax plenus*)? The *Classified List* is probably right in suggesting that it is a cross of *N. triandrus* × *Telamonius Plenus* (*syn. Van Sion*) or something similar. All it needs to be the perfect little daffodil is a better constitution.

In Divs. 5, 6, and 7 we can, I think, consider 5 and 7 together, since the problems facing the breeder are similar, while in Div. 6 the situation is quite different.

In Divs. 5 and 7, the problem is sterility in the F_1 generation; until this is overcome little real progress can be made; all that can be done is to keep making first crosses between the species and desirable new cultivars in other groups as they appear. I am quite sure that fertile F_1 triandrus and jonquil hybrids do occur occasionally in this country, but it happens so rarely that it can be ignored for all practical purposes. With different climatic conditions, perhaps they occur more frequently in America. I do not know, but if they do, then the breeder there may be in a position to make advances denied us over here. In this direction, it may well be

that the scientist may step in and take a hand by devising some technique for producing fertile F_1 plants.

With Div. 6, things are quite different, since all cyclamineus and trumpet crosses are fertile. In addition, fertile pollen, and sometimes seed, can be obtained from tazetta or poeticus crosses; here again, more often in America than in England, I understand. It also seems, for reasons that I cannot explain, that it is easier to get orange, or orange red, into small cyclamineus hybrids; Beryl is an example. But perhaps Beryl may illustrate the point I made when talking about Divs. 2 and 3, that we may have to go back to the beginning; Beryl is *cyclamineus* × *Chaucer*, and *Chaucer* was an interspecies cross.

Cyclataz (*cyclamineus* × *Soleil d'Or*) is another red-cupped hybrid. In both these cases it is very interesting to note that there has been no watering down of the color; it is as deep in the hybrids as in the parents. On the one occasion when I had seed from *Cyclataz* (it selfed itself), two of the three seedlings which resulted had cups as deep in hue as *Soleil d'Or*. One of these seedlings, *Tête-a-Tête*, gives fertile pollen, but I have not yet flowered any of its progeny.

The problems involved in breeding plants—and animals also, I suppose—go much deeper than things like chromosome counts. I have never come across any explanation of the fact that whereas crosses between trumpet and triandrus species, both having the basic daffodil chromosome number of 14, never, or almost never, produce fertile offspring, whereas *cyclamineus* with 14, when crossed with some tazettas with very odd numbers, occasionally does. The extreme example of this inconsistency is *N. × dubius* (*juncifolius* × *tazetta*), with 50 chromosomes, which is very fertile both as regards pollen and seed and so are its offspring.

I can see no reason why, in America in particular, Beryl, *Cyclataz*, and my seedlings *Tête-a-Tête* and *Jumblye*, crossed with the dwarfer trumpets, etc., should not produce some very small, nicely colored flowers.

So far as I know, almost nothing has

been done to breed small flowers belonging to Div. 8; I mean, of course, miniature Poetaz. I know there are five in the American Daffodil Society list of miniatures, four of which are of my own raising. Halingy and Hors d'Oeuvre are, it is true, Poetaz in form, but they are really poor flowers as far as form goes; their only real virtue is their extreme earliness. Although Angie and Shrew are classified as Div. 8, few could guess from their appearance to which division they belonged. For various reasons, I have dwelt with Cyclataz under Div. 6.

There seems to me, however, nothing serious in the way of breeding some really typical dwarf Poetaz. The basic parent would have to be, as far as I can see, either *Canaliculatus* or \times *dubius*, as these are the only very small tazettas. *N. \times dubius* has been used to some extent and is the parent of Angie, Pango, Raindrop, and Icicle, but these last two are in Div. 5. I think that the real line of advance lies in crossing \times *dubius* and *Canaliculatus* (especially the latter) with the best large tazettas and Poetaz. I feel certain that many of the Poetaz produce viable pollen. The weak point of *Canaliculatus*, at least in most places in England, is its addiction to increasing at an enormous rate but failing to produce any flowers. This trait may, however, disappear in the F_1 or

F_2 generations. It is a line of breeding well worth following.

This brings me almost to the end of my story. Unless, which is quite unlikely, some wild dwarf forms of *N. poeticus* turn up, or, which is not much more likely, one of the garden poets mutates and produces a miniature form, nothing at all can be done with Div. 9.

There is, I believe, little more that can be done with Div. 11, save only the bulbocodiums as discussed at the beginning of this chapter. Almost all species crosses must, by this time, have been made many times over. Of course, since the number of possible combinations of genes between any two species is very great—it possibly runs into the millions—better forms than those which now exist may well appear from time to time, but I feel certain it is hopeless to expect any really new breaks; we know just about the sort of plants to expect from any interspecies cross.

I hope, however, that without having to rely in any way on hybrids between species, this commentary will have suggested the endless possibilities which exist for the production of new and ever more beautiful miniature daffodils. I also hope with all my heart that there are many daffodil lovers in America who will devote their talents to this most fascinating pursuit.



PLATE 55

ALEC GRAY

MARY PLUMSTEAD
Triandrus Hybrid (Div. 5a)

—24— Choosing and Registering Daffodil Names

The rules governing the naming of daffodils and the procedure for the registration of the names arises out of the International Code of Nomenclature for Cultivated Plants. The Code in substantially its present form was prepared by the International Commission for Nomenclature of Cultivated Plants, an agency of the International Union of Biological Sciences (a UNESCO unit). The Code was endorsed for horticulture by the 15th International Horticultural Congress at Nice, France in 1958.

The Code contemplates the designation by the International Horticultural Congress of international registration authorities for various genera of ornamental plants. That Congress in 1955 appointed the Royal Horticultural Society, Great Britain, as International Registration Authority for narcissus (daffodils). The Society is thus responsible for accepting new daffodil names and for maintaining permanent registration files for those names.

The Royal Horticultural Society first published a *Classified List of Daffodil Names* in 1908, and numerous revised editions at intervals thereafter. Following the Society's appointment as International Registration Authority for narcissus, it changed the name of the publication in 1958 to the *Classified List and International Register of Daffodil Names* and revised it in 1961 and 1965. The *Register* is kept up to date by publishing newly registered names in the *Daffodil and Tulip Year Book*, published annually by the Society.

REGISTRATION PROCEDURES

The American Daffodil Society registers daffodil names, and the new names so registered appear from time to time

in *The Daffodil Journal* published by the Society. The registrar is Mrs. Kenneth B. Anderson, 4810 Palm Drive, La Canada, California, 91011. Application is made on a form obtained from the registrar. The application requires information as to the proposed name, classification of the flower in accordance with the Revised System for the Classification of Daffodils, name of raiser, year first flowered, diameter of flower and of corona, length of corona and of perianth segment, height of flower stem, season of bloom (as early, midseason, or late), color of perianth and of corona, the existing named daffodil variety that the plant and flower most nearly resembles and differences between the two, other outstanding characteristics, and parentage. Registration fee is \$1.00.

Under the International Code of Nomenclature for Cultivated Plants, it is required that when an international authority and a national authority are both registering names for the same genus, the registration of a name by the national authority is subject to confirmation by the international authority. Therefore, the American Daffodil Society obtains this confirmation from the Royal Horticultural Society before acceptance of a name for registration. United States breeders and introducers will find it more convenient to submit new daffodil names for registration through the registrar of the American Daffodil Society, since they will be saved the trouble of confirming the proposed names. The \$1.00 fee includes the charge for registration by both societies.

GUIDES IN CHOOSING NAMES

The International Code of Nomenclature for Cultivated Plants does not

legally oblige a breeder or introducer to conform to the Code in choosing a daffodil name, any more than it creates a legal obligation for him to register that name. It is in the interests of breeders and introducers and of gardeners and horticulturists, however, that the Code be observed and thereby confusion, mistakes, and deceit minimized.

The following guides are pertinent in choosing a daffodil name:

1. New daffodils should be introduced only as clones, susceptible of vegetative propagation. A garden form of a wild species, or a particular seedling bulb from a cross of wild species or of garden varieties, or a sport of a wild species or of a garden variety may be selected as the origin of the clone to be distributed and vegetatively propagated, as by bulb division. The originally selected plant and the aggregate of the plants descended from it by vegetative (asexual) propagation constitute the "clone."

2. The plant selected for propagation as a clone and naming should be clearly superior to varieties in existence. Seedlings not superior are best destroyed and certainly not named. If amateurs go in for hybridizing and especially for selecting and naming new plants, it is important that they be familiar with the many botanical species, varieties, and forms, and especially the garden clones now in cultivation. Too often amateurs have merely gone back over the route of older breeders. Too often a certain simple wonder beclouds their judgment in the face of their own new seedlings. Daffodils are selected, named, and introduced that are inferior or at most not really an advance on those at hand. Real novelties are not as easily come by as we might expect, nor are amateur hybridizers and introducers generally as knowledgeable and discriminating as we might hope.

3. Where the selection to be named is a seedling from a cross and indication of parentage is desirable, it may be done by use of a formula as: N. White Star (*poeticus* × Beersheba). In preferred American usage the female parent is written first in such a formula.

4. A daffodil already named should not be renamed. Renaming occasionally happens because of the difficulty with some foreign name, or because of some commercial advantage to be obtained from a new name.

5. The name of a new daffodil should be a common (fancy) name in English if the raiser or introducer is one of the English-speaking peoples. It should not be a Latin name or one in Latinized form. The name should begin with a capital letter and in print be in Roman type.

6. Do not duplicate a name already in the *Classified List and International Register of Daffodil Names* or in the *Year Book* supplements thereto. To avoid confusion it is well also not to duplicate names of daffodils that appeared in earlier editions of the *Classified List*, as that for 1954. In preparing subsequent editions of the *Classified List* the British omitted many earlier names as being those of varieties no longer in existence. However, a plant no longer in existence in Great Britain or Holland may well turn up in some United States, Australian, or New Zealand garden. Further, it is well to avoid duplicating a name that, while it has never appeared in the *Classified List* at all because of oversight in compiling the *Classified List* or failure to register, is nevertheless in existence and is a validly published name. "Validly published" means simply that the name has previously been published in some standard periodical, such as *The Daffodil Journal*, or in a catalog or check list mechanically printed, dated, and distributed without restriction.

7. Single-word names are best, two-word names should be the outside limit. Wherever possible, avoid A, The, initials, and titles from Mr. and Mrs. to Dr. and President; likewise, the names of states or countries alone, exaggerations, and similarities likely to cause confusion, as Ladybird and Lady Bird, or Ares, Aries, and Ariel.

8. No name of a living person should be used without that person's permission.

—25— Exhibiting and Judging Daffodils

The daffodil is an ideal flower for exhibition purposes and shows featuring them, either alone or with other spring flowers, are held wherever daffodils are grown. In the United States, the showing of daffodils is encouraged by the American Daffodil Society and shows which meet certain standards are approved by the Society and thereby become eligible to offer certain awards. Approved shows are judged by teams of judges who have been accredited by the Society upon satisfactory completion of a series of three all-day training and practice sessions, proof of growing not less than 100 varieties of daffodils, and after having gained certain experience as an exhibitor and as a student judge working in association with accredited judges.

Daffodil shows can be large or small, complex or simple, but the mechanics of holding one is beyond the purpose of this Handbook. However, selection of flowers for exhibition and the basis upon which they will be scored by the judges relate to the flower itself and are within our scope. The special culture of daffodils for exhibition purposes is described in Chapter 2. Gardeners who become interested in showing their flowers will find membership in the American Daffodil Society desirable, and it is required of all accredited judges.

CHARACTERISTICS

When choosing blooms for the show table, the grower should keep in mind that not all varieties have the combination of characteristics which makes the blooms suitable for the show table. Some varieties may be good growers and produce an abundance of bloom, but they may lack one or more of the qualities which make the judges take a second look.

An exhibition bloom should be shown at the most perfect stage of its possible beauty. The qualities which combine to make a daffodil of show caliber are good form, color, substance, texture, size, stem, condition, and pose. If any one of these qualities is poor, the full beauty of the flower is not achieved.

Form and condition are the two most important qualities. What might be considered good form for a certain division might be objectionable when found in members of another division; therefore, it is well to study the proper forms of all eleven divisions as classified by the Royal Horticultural Society. The drooping form of a triandrus hybrid or the reflexed perianth of the cyclamineus hybrid would be objectionable in trumpet or large-cupped varieties, depending on the amount of the characteristic present. Good form for an exhibition daffodil is that which most nearly approaches perfection for the division to which the bloom belongs. Regardless of division, nicks and mitten thumbs in the perianth segments and cupping of petals and sepals all affect form adversely.

Color depends on variety. Good color is one which is clear, bright, and glistening; muddy color and streaking are faults. In bicolor varieties the combination should be pleasing. As certain varieties develop, they reach a stage when the color is at that perfect phase at which the bloom will have all its possible beauty. This is the ideal stage for exhibition. Trousseau and the reversed bicolors are examples of varieties where color is critical and specimens should be shown only at the ideal stage.

Substance and texture are closely related. Substance is best described as thickness of the floral parts while texture may be likened to a fabric, coarse

or fine, rough or smooth, ribbed or crepe-like. Loss of substance usually affects texture. Ideal substance and texture might be described as perianth and corona crisp, smooth, and thick, with a sheen.

Size of bloom depends on variety. If size is slightly large for the variety, one usually attributes it to good culture, but if size is extra large, form may be affected and the bloom may appear floppy and coarse.

Pose should be typical for the division. If perfect pose for the division is a bloom held at right angle to the stem or slightly higher, then one which droops its head and fails to "look you in the eye" is somewhat less than in its perfect phase. A neck which is too long may cause a drooping pose, and a neck which is too short may produce an upright pose.

The overall condition of the exhibition daffodil should be as near perfect as possible. Mud, dirt, or rain-streaking should be removed with a soft brush wet with detergent in water and dried with cotton. Bruises should be avoided by careful handling.

The best method to use when choosing a daffodil for exhibition is as follows: first, know what is perfection for the variety, then mentally measure each characteristic against perfection. Unless the bloom has several good qualities, it might be better to leave it for decoration in the garden. Many fine garden varieties when at their best do not have enough good qualities to rate on the show table.

JUDGING

Exhibition daffodils are judged against perfection for the variety and not against one another. It is most important that judges know varieties in order to establish a mental picture of perfection for a particular variety. No judge can properly evaluate material which he has neither grown nor studied.

A good judge does not allow personal preference to influence a decision. A judge who does not grow doubles or split-corona daffodils because he dislikes them, has to put aside this feeling at the

show bench and be as conscientious when judging one division as another. Miniatures should receive the same careful consideration as large blooms.

CONDITION. In judging exhibition daffodils, the scale of points adopted by the American Daffodil Society allows 20 points for condition.

Qualities which are considered under condition are age of bloom, which should be neither too young nor too old, and absence of minor blemishes, such as rain spots, sunburn, dirty marks, nicks, and splits in the crown or perianth. In close competition some of the fine points which may be considered are the condition of pollen sacs (anthers) and stigma, size of ovary, and condition and color of the sheath. The anthers should be creamy yellow with a fresh appearance. If the pollen is gone and the sacs are tan or brown, the flower is aging. The stigma should glisten with a small amount of moisture. If dry and shriveled the bloom is past its prime. The ovary, the immature seed vessel which is found directly behind the bloom, should not be unduly swollen. The sheath should be present and should be light brown.

FORM. Form of bloom receives 20 points. The judges will expect the flower to have six even overlapping perianth segments and the inner whorl or petals should overlap the outer whorl or sepals in a regular manner. The cup or crown should be well balanced in proportion to the perianth and the segments should be flat, although a slight incurve or reflexing will not necessarily be penalized. A very slight incurve of petals is not a serious fault in certain varieties. When the incurve is so pronounced that the petals take on a definitely hooded effect, however, then form will be penalized. Some varieties normally have a slight reflexing of petals. *N. cyclamineus* and its hybrids would be deficient in form without this characteristic. The petals may be round, heart-shaped, or pointed, and in certain varieties slightly wavy, but the waviness should not be exaggerated. The cup or crown may be serrated, flanged, or frilled, but must not be ragged or split

except in a few cases of what are now known as the split-corona daffodils, such as *Evolution*. This is another illustration of the need for judges to know varietal characteristics.

TEXTURE AND SUBSTANCE. Texture is the smoothness or roughness of the tissue structure of the bloom. Crepiness and ribbing are faults. Texture and substance receive 15 points. Substance is the firmness and thickness of the tissue structure. The first sign of loss of substance will be noted by the judges on the edges and tips of petals and will be characterized by thinness and loss of sheen and translucency. This is followed by browning of the edges of both the segments and corona. Loss of substance is often confused with condition, because the lasting quality of the flower is closely related to substance. Blooms with good substance keep well both on the plant and as cut flowers. The presence of sheen denotes fineness of both substance and texture.

COLOR. Color is given 15 points. The judges will not look with favor on streaking or muddiness; the color should be rich and pure. Some varieties are characterized by peculiar color qualities and the number is rapidly growing. Here again judges are expected to know perfection for these varieties, such as *Jezebel* and *Rouge*. Because vivid colors may not be sunproof, improper handling may result in washed-out coloring. Soil and weather also influence color. Bicolor varieties should have definite color contrast; there should be no doubt about the classification of a bicolor. Although some shading or staining of a deeper color is permissible at the base of the perianth, staining is not a good point in an exhibition flower as a rule, although *Effective* is a notable exception. It is expected that white trumpets will be white, although a hint of green at the base of the segments is tolerated and preferable to yellow.

POSE. The pose of a daffodil, or the angle at which the bloom is attached to the stem, receives 10 points. The pose varies with certain divisions. In the first four divisions with a few exceptions and in Div. 9 the bloom should be nearly at

right angle to the stem and therefore vertical when viewed from its own level. Some authorities believe there should be some latitude in the angle of the flower to the stem and that a slight tilt either up or down is not objectionable. The neck should not be so long that it allows the flower head to droop, and it is possible for the neck to be so short that it produces a stiff appearance. Divs. 5, 6, 7, and 8 each have their characteristic pose which a competent judge will recognize. This question is becoming more important and complex each year due to inter-divisional hybridization.

STEM. The stem of a show flower must be strong enough to support the weight of the flower head, long enough to be in proportion to the size of the flower, straight, and not unduly thick. It should be green throughout; a blanched end indicates the flower was cut below the ground level. Such an area will not absorb water well after the flower has been cut and the life of the flower is thereby shortened. The official scale allows 10 points for stem.

SIZE. Another 10 points are given a bloom for proper size, according to variety. Other qualities being equal, the larger flower may expect the judges' nod, since it indicates better culture.

OTHER FACTORS. There are other factors which may be considered when daffodils are judged and which are not included in the official scale of points, but which experienced judges will have in mind when the competition is close. Balance and position of anthers fall into this category. There may also be added value in good balance between perianth and cup. This equipoise is difficult to define, since perfect balance may be found in trumpets as well as small cups. The length of the petals, width, shape, and general appearance must be considered in deciding whether there is any lack of grace in a bloom. Every part of a bloom should be in proportion to every other part. If an imaginary line drawn along the stem through the face of the bloom coincides with the midrib and tip of a major or minor petal at both top and bottom of the bloom, then the flower has "axis balance." This is a

fine point, but when judging becomes close, such minutiae are considered.

There is one more quality which is important on the show bench and that

is the elusive virtue of refinement or good breeding. A survey of the blue ribbon winners at any show will demonstrate this point more clearly than words.

Judging by Container

Henry Dyer of Christchurch relates how he was invited to judge at a small show in the country and on arrival found that the district had just started out on its first daffodil show and the blooms were in all manner of containers. When he came to the yellow trumpets, there were two entries and Henry could not tell which was the worst. They were the same variety and both were slug-eaten and had evidently been entered by someone who "wanted to help the show along." One was staged in a beer bottle and the other in a whiskey bottle. In the judge's words: "I gave it to the one in the whiskey bottle."

Philip Phillips
Otorohaga, New Zealand

APPENDIX A DAFFODIL LITERATURE

The list that follows is not intended to be comprehensive. It includes books and serial publications devoted entirely or in large part to daffodils as garden plants; some books, chiefly recent, in which there are chapters or sections with significant treatment of daffodils; and a few reference books. Students of daffodil history and nomenclature will find guidance in the bibliographies included in some of the general works on daffodils, as well as in the "References to Further Literature."

Publications of Societies

AMERICAN DAFFODIL SOCIETY.

THE AMERICAN DAFFODIL YEARBOOK. Arlington, Va. (etc.), 1956-1964. illus. Issued 1956, 1957-58, and annually from 1959 to 1964.

Includes the annual symposium on varieties and a wide range of articles of interest to members.

THE DAFFODIL DATA BANK OF THE AMERICAN DAFFODIL SOCIETY.

Des Moines, Iowa, 1965. 103 p.

Lists more than 3,000 cultivars and many species and wild forms, giving available data on parent varieties, breeder, color, season, height, chromosome count, fertility, and date of registration, as assembled by Dr. Tom D. Throckmorton and recorded in the Daffodil Data Bank (electric computer), at The Computer Center, The Iowa Methodist Hospital, Des Moines, Iowa.

THE DAFFODIL JOURNAL, vol. 1, no. 1, Sept. 1964—(current).

A quarterly publication for members of the Society.

AMERICAN HORTICULTURAL SOCIETY

THE AMERICAN DAFFODIL YEAR BOOK. Washington, D. C., 1935-1938 and 1942. illus.

These year books, edited by B. Y. Morrison, include a wealth of material relating to daffodil growing and daffodil personalities in all sections of the United States during the period covered. Many of the illustrations are full-size varietal portraits. The 1942 year book entitled *The Daffodil Year Book* was published in cooperation with the Royal Horticultural Society.

AMERICAN PLANT LIFE SOCIETY.

HERBERTIA, VOL. 13. NARCISSUS EDITION. Stanford, Calif., 1946. 186 p. illus.

Includes articles on Narcissus cytology, parentage records, breeding, and culture.

HERBERTIA, 1953, SECOND NARCISSUS EDITION. Arcadia, Calif. 1953. 124 p. illus.

Issued as *Plant Life*, vol. 9, no. 1, January 1953.

About half of this issue is devoted to articles on daffodil varieties, breeding, and culture, with illustrations.

PLANT LIFE, vol. 1, no. 1. Stanford, Calif., April, 1945. 26 p.

The entire issue is devoted to Narcissus.

CALIFORNIA HORTICULTURAL SOCIETY.

JOURNAL, vol. 1, no. 3. San Francisco, Calif., July, 1940.

Almost the entire issue is devoted to the proceedings of a daffodil conference held in Berkeley on March 16, 1940. Papers on various aspects of daffodil culture and breeding under California conditions were presented.

THE ROYAL HORTICULTURAL SOCIETY.

THE DAFFODIL YEAR BOOK. London, 1913-1940. illus., some col.

THE DAFFODIL AND TULIP YEAR BOOK. London, 1946- (current) illus., some col.

Issued annually 1913-1915, 1933-1940, 1946-date.

Articles both scientific and personal, illustrations, some in color, show reports from England, America, Australia, and New Zealand, and records of daffodil registrations and awards constitute a continuing history of daffodils and daffodil growers in the English-speaking world.

CLASSIFIED LIST AND INTERNATIONAL REGISTER OF DAFFODIL NAMES. London, 1965.

This is the 19th edition of the Society's compilation of daffodil names, with official classifications, names of breeders and introducers, dates of registration, and record of major British and Dutch awards. In addition to cultivar names the list includes names of species, subspecies and their varieties, and natural hybrids, followed by the authorities for the names.

Editions of 1908-1955 had title: *Classified list of daffodil names.*

WASHINGTON DAFFODIL SOCIETY

YEARBOOK, 1955. Washington, D. C., 1955. 36 p.

This was distributed also as a publication of the American Daffodil Society.

Some Books and Pamphlets on Daffodils.

BARR, PETER. YE NARCISSUS OR DAFFODYL FLOWRE, AND HYS ROOTS, WITH HYS HISTORIE AND CULTURE, &c, &c., WITH A COMPLETE LIST OF ALL THE KINDES GROWN IN ENGLISHE GARDINS. Embellished with manie woodcuts. London, 1884. 48 p. illus.

This small booklet may be considered a summary of daffodil knowledge in England at the time of The Royal Horticultural Society Daffodil Conference in 1884. The list of varieties (p. 33-48) was compiled from the literature as well as from living plants, and includes numerous names not identified with living plants.

BOURNE, S. E. THE BOOK OF THE DAFFODIL. London, 1903. 112 p. illus. (Handbooks of practical gardening XVI)

"The book has grown out of a paper on 'The cultivation of the Narcissus in gardens' read before The Royal Horticultural Society in the year 1900."

BOWLES, E. A. A HANDBOOK OF NARCISSUS. London, 1934. 248 p. illus.

"This book represents an attempt to collect information scattered in the works of earlier writers and to present it in a handy form, correlated with observations made on wild hillsides, in gardens and museums, and at flower shows. It embodies the experience gained during over thirty years' work for The Royal Horticultural Society and more than forty years as an active gardener.

"It is intended for those of the garden-loving public who like to know something of the botanical relationships and geographical distribution of the wild species, as well as for those who grow the choice garden-raised varieties for the sake of their beauty."—Preface.

The 26 plates are from drawings by the author.

BRUMBACH, WILLIAM C. THE ROMANCE OF DAFFODILS. New York, 1959. 47 p.

A personal account of the search for old varieties, chiefly in Virginia and farther south.

BURBIDGE, F. W. THE NARCISSUS: ITS HISTORY AND CULTURE . . . TO WHICH IS ADDED . . . A SCIENTIFIC REVIEW OF THE ENTIRE GENUS, BY J. G. BAKER. London, 1875. 48 col. pl.

The 48 hand-colored plates of Narcissus species and varieties are an outstanding feature of this book.

"Select descriptive list of authors, works of reference, and illustrated periodicals, containing valuable information and figures of the species of *Narcissus*": p. 89-91.

CALVERT, ALBERT F. DAFFODIL GROWING FOR PLEASURE AND PROFIT. London, 1929. 412 p. col. front., 236 plates.

This book covers many phases of daffodil culture. Included are chapters by many of the leading daffodil-growing personalities of the day, and an unusually full treatment of commercial aspects of daffodil growing. The plates illustrate a wide range of varieties.

CARTWRIGHT & GOODWIN. THE LATEST HOBBY. HOW TO RAISE DAFFODILS FROM SEED. Kidderminster, 1908? 60 p. illus.

Practical suggestions on methods and choice of varieties for breeding.

COLEMAN, CYRIL F. Hardy bulbs, vol. 2: DAFFODILS, TULIPS, AND HYACINTHS. Prepared in conjunction with The Royal Horticultural Society. London, 1964. 220 p. illus. (Penguin handbook 109)

Pages 13-147 and 92 illustrations are devoted to daffodils.

The author is a vice-chairman of The Royal Horticultural Society Narcissus and Tulip Committee, and a successful daffodil breeder and exhibitor.

GRAY, ALEC. MINIATURE DAFFODILS. London, 1955. 57 p. illus.

"The aims of this book are two-fold: firstly to try to give information on the growing of dwarf daffodils to those interested, and, secondly, to enable those who cannot attend shows, etc., where they can see the flowers for themselves, to select those which appeal to them and are most suitable for their purposes."—Introduction.

GRIFFITHS, DAVID. DAFFODILS. U. S. Dept. of Agriculture Circular 122, Washington, D. C., 1930 (slightly revised 1934). 73 p. illus.

Commercial daffodil culture under American conditions.

JACOB, J. DAFFODILS. London, 1910. 115 p. 8 col. pl. (Present-day gardening)

The author was secretary of the Midland Daffodil Society.

JEFFERSON-BROWN, M. J. THE DAFFODIL, ITS HISTORY, VARIETIES AND CULTIVATION. London, 1951. 264 p. illus., some in color.

In addition to the topics mentioned in the subtitle there are several special features. Appendix A gives a short summary of the cytological work of Abilio Fernandes concerning the genetic relations of members of the genus *Narcissus*. Appendix B is a list of specific names. Appendix C is a bibliography.

JEFFERSON-BROWN, M. J. DAFFODILS FOR AMATEURS. London, 1952. 96 p. illus., incl. 1 col. pl.

KIMBROUGH, W. D, AND HANCHEY, R. H. DAFFODILS FOR THE YARD. Louisiana Agricultural Experiment Station Bulletin no. 500. Oct. 1955. 16 p. illus., incl. 1 col.

Includes list of varieties tested and recommendations based on results of tests.

KIRBY, A. M. DAFFODILS, NARCISSUS, AND HOW TO GROW THEM AS HARDY PLANTS AND CUT FLOWERS, WITH A GUIDE TO THE BEST VARIETIES. New York, 1907. illus.

This was the first American book devoted to daffodils.

MATHER, JOHN C. COMMERCIAL PRODUCTION OF TULIPS AND DAFFODILS. London, 1961. 212 p. illus.

Deals with the production of forced flowers, outdoor flowers, and bulbs for market. The treatment of bulb troubles is particularly thorough.

QUINN, CAREY E. DAFFODILS, OUTDOORS AND IN. New York, 1959. 204 p. illus.

The first American book on daffodils in fifty years, this book reflects the increasing interest in daffodils and daffodil shows in various sections of this country, with emphasis on selection of varieties. Arranging and preserving daffodils are also treated.

ROSEWARNE EXPERIMENTAL HORTICULTURE STATION. NARCISSUS VARIETY TRIALS. Camborne, England, 1964. 109 p.

Data for about 700 varieties which could be of economic importance for flower and bulb production in the open. In tabular form under 17 headings deals with freedom of bloom, time of flowering, rate of bulb increase, vase life of cut flowers, measurements of foliage and flowers, and characteristics of pose, neck, and stem. Part II contains detailed description of flowers of same varieties.

Also of Interest

(Some more general books including significant treatment of daffodils).

ANDERSON, E. B. Hardy bulbs, vol. I: BULBS FOR THE OUTDOOR GARDEN EXCEPT THE LARGER HYBRIDS OF HYACINTHS, NARCISSUS, AND TULIP. Prepared in conjunction and collaboration with The Royal Horticultural Society. London, 1964. 176 p. illus. (Penguin handbook 108) Pages 128-142 deal with *Narcissus* species and small hybrids, with 8 illustrations.

DIX, J. F. Ch. BULB GROWING FOR EVERYONE. London, 1957. 147 p. illus., col. plates.

Translated from the Dutch.

Daffodils are treated on p. 16-17 (history), 33-34 (pot culture), and 73-80 (outdoor culture). 16 popular varieties are included in color plates IV, XIII-XV.

GENDERS, ROY. MINIATURE BULBS. New York, 1963. 191 p. illus.

Originally published in England. Includes numerous references to small daffodils, and 7 illustrations from photographs.

GOULD, CHARLES J., ed. HANDBOOK ON BULB GROWING AND FORCING BULBOUS IRIS, EASTER LILIES, HYACINTHS, NARCISSUS, TULIPS. Published by the Northwest Bulb Growers Association. Mt. Vernon, Wash., 1957. 196 p. illus.

"This handbook was planned to assemble under one cover the main facts on growing, storing, and forcing of ornamental bulbs and to relate them in a manner useful for growers, dealers, forcers, and others connected with the bulb industry. The handbook is the logical outgrowth of the annual Bulb Growers' Short Courses sponsored by Washington State College, Northwest Bulb Growers Association, and the Washington State Dept. of Agriculture. . . . The authors are all specialists in their fields.

The section on narcissus, p. 99-138, includes chapters on culture, weed control, forcing, and various diseases and insects.

GREY, CHARLES H. *HARDY BULBS*. London, 1937-38. 3 v. illus.

Narcissus: v. 2, p. 69-83. A listing of species and wild forms with descriptive and other notes on many.

LAWRENCE, ELIZABETH. *GARDENS IN WINTER*. New York, 1961. 218 p. illus.

Contains numerous references to winter-blooming daffodils, with illustrations from drawings by Caroline Doimon.

LAWRENCE, ELIZABETH. *THE LITTLE BULBS, A TALE OF TWO GARDENS*. New York, 1957.

"Little daffodils": p. 46-80. The author's experiences with small species and hybrids in North Carolina.

MILES, BEBE. *THE WONDERFUL WORLD OF BULBS*. New York, 1963. 348 p. illus., col. plates. Chapter 7, "A host of carefree daffodils": p. 103-128.

PRKINSON, JOHN. *PARADISI IN SOLE PARADISUS TERRESTRIS*. Faithfully reprinted from the edition of 1629. London, 1904. 612 p. illus.

Chapter IX, "Narcissus, The Daffodill": p. 67-108, including 9 pages of illustrations (woodcuts).

Names, in Latin and English, of nearly a hundred kinds of "daffodill" known in England in the early 17th century, with descriptions and notes on their season of bloom, place of origin, and history of the names. Included are some plants no longer classified in the genus *Narcissus*.

ROCKWELL, F. E., AND GRAYSON, ESTHER C. *THE COMPLETE BOOK OF BULBS*. Garden City, N. Y., 1955. 352 p. illus., col. plates.

Chapter 11, "Daffodils": p. 124-150.

SYNGE, PATRICK M. *THE COMPLETE GUIDE TO BULBS*. New York, 1962. 319 p. illus., includes color plates.

Narcissus: p. 232-255, pl. XVI-XVIII and col. pl. 25-27. The colored plates are from paintings and show 11 species and 18 modern varieties.

WISTER, GERTRUDE S. *HARDY GARDEN BULBS*. New York, 1964. 176 p. illus.

Chapter 5, "Daffodils": p. 56-91.

Dictionaries and Cyclopedias

(These books, generally available in libraries, include lists and brief descriptions of most of the wild forms currently in trade.)

BAILEY, L. H., AND BAILEY, E. Z. *HORTUS SECOND*. New York, 1941. 778 p.

BAILEY, L. H. *THE STANDARD CYCLOPEDIA OF HORTICULTURE* (2d ed) New York, 1942. 3v.

THE ROYAL HORTICULTURAL SOCIETY. *DICTIONARY OF GARDENING*. Ed. by Fred J. Chittenden. Oxford, 1951. 4 v. illus. and Supplement, 1956.

References to Further Literature

ATWOOD, ALICE C. *DAFFODIL LITERATURE*. The American Daffodil Year Book, 1935, p. 83-88.

This list was compiled from entries in the Botany Catalogue of the U. S. Department of Agriculture Library (now National Library of Agriculture). The entire subject catalogue has been printed and may be consulted in large or specialized horticultural libraries.

COLEMAN, CYRIL F. *DAFFODIL LITERATURE*. The Daffodil and Tulip Year Book, 1954, p. 74-80.

This article and the lists appended emphasize sources of information on daffodil history, nomenclature, and illustrations.

KING, HAROLD S. *DAFFODIL BIBLIOGRAPHY* (unpublished).

Dr. King, Chairman of the Health and Culture Committee of the American Daffodil Society, has accumulated several thousand references on all phases of daffodil information.

SCORGIE, HELEN C. *APPLES OF GOLD*. The 1961 American Daffodil Yearbook, p. 12-16.

Appreciative comment on some favorite works on daffodils.

U. S. DEPT. OF AGRICULTURE. NATIONAL AGRICULTURAL LIBRARY. *BIBLIOGRAPHY OF AGRICULTURE*. v. 1- 1942- (current)

Current listing of books and articles in publications received in the National Library of Agriculture. Subject indexes annually.

APPENDIX B

APPROVED LIST OF MINIATURE DAFFODILS

Varieties of Garden Origin, Species, Wild Forms, and Wild Hybrids

Division	5b Hawera	10 <i>pseudo-narcissus</i> subsp. <i>bicolor</i>
5b Agnes Harvey	10 <i>hedraeanthus</i>	6b Quince
10 <i>alpestris</i> = <i>pseudo-narcissus</i> subsp. <i>alpestris</i>	7b Hifi	5b Raindrop
10 Angel's Tears = <i>triandrus</i> var. <i>albus</i> .	8 Hors d'Oeuvre	4 Rip van Winkle = <i>minor</i> var. <i>pumilus</i> 'Plenus' (Hort.)
8 Angie	11 Jessamy	1b Rockery Beauty
5b April Tears	6a Jetage	1c Rockery Gem
5b Arctic Morn	10 <i>jonquilla</i>	1c Rockery White
10 <i>asturiensis</i>	4 <i>jonquilla</i> 'Flore Pleno' (Hort.)	2a Rosaline Murphy
10 <i>atlanticus</i>	10 <i>jonquilla</i> var. <i>minor</i>	10 <i>rupicola</i>
10 <i>Aurantiacus</i> = <i>triandrus</i> 'Aurantiacus' (Hort.)	10 <i>jonquilloides</i>	10 <i>rupicola</i> var. <i>marvieri</i>
7b Baby Moon	6a Jumblic	10 <i>scaberulus</i>
7b Baby Star	10 <i>juncifolius</i>	7b Sea Gift
1b Bambi	4 Kehelland	5a Sennocke
7b Bebop	11 Kenellis	8 Shrew
10 <i>bertolonii</i> = <i>tazetta</i> subsp. <i>bertolonii</i>	7b Kidling	5a Shrimp
10 <i>bicolor</i> = <i>pseudo-narcissus</i> subsp. <i>bicolor</i>	7b La Belle	10 <i>simplex</i> = <i>jonquilla</i>
7b Bobbysoxer	7b Lintie	7a Skiffle
1a Bowles's Bounty	1b Little Beauty	1a Sneazy
10 <i>bulbocodium</i> (various)	1a Little Gem	6a Snipe
10 <i>calathinus</i> = <i>triandrus</i> var. <i>loiseleurii</i>	7a Little Prince	1c Snug
10 <i>calcicola</i>	10 <i>lobularis</i> = <i>minor</i> var. <i>conspicuus</i>	7b Stafford
10 <i>Canaliculatus</i> = <i>tazetta</i> subsp. <i>lacticolor</i> 'Canaliculatus' (Hort.)	10 × <i>macleayi</i>	7b Sundial
10 <i>cantabricus</i> (various)	2a Marionette	7b Sun Disc
1a Charles Warren	10 <i>marvieri</i> = <i>rupicola</i> var. <i>marvieri</i>	11 Taffeta
5b Cobweb	11 Marychild	1a Tanagra
1c Colleen Bawn	5a Mary Plumstead	11 Tarlatan
10 <i>concolor</i> = <i>triandrus</i> var. <i>concolor</i>	6a Mini-Cycla	10 <i>tazetta</i> var. <i>bertolonii</i>
7b Curlylocks	10 <i>minimus</i> = <i>asturiensis</i>	10 <i>tazetta</i> subsp. <i>lacticolor</i> 'Canaliculatus' (Hort.)
10 <i>cyclamineus</i>	10 <i>minor</i>	10 × <i>tenuior</i>
8 Cyclataz	10 <i>minor</i> var. <i>conspicuus</i>	6a Tête-a-Tête
7b Demure	10 <i>minor</i> var. <i>pumilus</i>	6a The Little Gentleman
10 × <i>dubius</i>	4 <i>minor</i> var. <i>pumilus</i> 'Plenus' (Hort.)	10 <i>triandrus</i> var. <i>albus</i>
11 Elfhorn	6a Mite	10 <i>triandrus</i> 'Aurantiacus' (Hort.)
4 Eystettensis (Hort.)	6a Mitzy	10 <i>triandrus</i> var. <i>cernuus</i>
10 <i>fernandesii</i>	2a Morwenna	10 <i>triandrus</i> var. <i>concolor</i>
7b Flomay	11 Muslin	10 <i>triandrus</i> var. <i>loiseleurii</i>
6a Flyaway	2a Mustard Seed	10 <i>triandrus</i> var. <i>pulchellus</i>
5b Frosty Morn	10 <i>nanus</i> = <i>minor</i>	2b Tweeny
6a Greenshank	11 Nylon (hybrid group)	10 <i>watieri</i>
8 Halingy	7b Pease-blossom	1a Wee Bee
	4 Pencrebar	7b Wideawake
	2a Picarillo	1c W. P. Milner
	7b Pixie	4 Wren
	11 Poplin	3c Xit (hybrid group)
	10 <i>pseudo-narcissus</i> subsp. <i>alpestris</i> (syn. Lent Lily)	

APPENDIX C

List of Retail Daffodil Dealers

The marketing of daffodils tends to be an individual or family enterprise, especially where new varieties are involved. Breeders usually handle their own varieties and only those of other breeders which are outstanding or non-competitive and essential to a well-balanced list. As a result successful breeders are almost forced to go into business if they are to find a market for their creations and gain any reward. However, continuance of these businesses is often dependent upon the health and enthusiasm of one individual; they begin quietly and may end suddenly.

The list which follows is of dealers who have expressed willingness to handle orders from American gardeners. Most of them are daffodil specialists, a few are bulb dealers, and one or two are general nurserymen. Unless an exception is noted, each has a catalog or price list. Those located abroad will forward orders by parcel post upon receipt of the usual import tags as explained in Chapter 21.

Obviously any list of dealers is incomplete and only momentarily accurate. No attempt has been made to include domestic sources such as Wayside Gardens, White Flower Farm, Park, Vaughan, or other dealers in seeds and plants who stock a selection of standard varieties as part of their general business.

Finally, there are numerous amateur breeders at work in all daffodil-growing countries. A few of their varieties are of the utmost importance, many are desirable regional varieties. In some cases, especially where they are good increasers, a commercial dealer may undertake to propagate and offer them. Other varieties, equally worthwhile, have no trade outlet and are distributed only as gifts, by barter, or some other private arrangement.

DAVID BELL, P. O. Box 36, Templeton, New Zealand. Issues a 64-page illustrated and descriptive catalog; grows about an acre of daffodils by the organic method; introduces new varieties regularly; acquired stocks of George Lewis.

BROADLEIGH GARDENS (Walter Stagg), Sampford Arundel, Wellington, Somerset, England. Purchased the stock of Alec Gray in 1964 and expects to continue sales in United States. Will offer future Gray introductions. Catalog of small daffodils and other small bulbs.

M. E. BROGDEN, Normanby, Taranaki, New Zealand. Grows about an acre of daffodils and releases new seedlings regularly; illustrated and descriptive catalog.

E. W. COTTER, 313 Hills Road, Shirley, Christchurch, New Zealand. Issues a descriptive and illustrated catalog; raises seedlings but only limited number released as yet; specializes in miniatures.

THE DAFFODIL MART, (George W. Heath), Gloucester, Va. The longest list of American-grown bulbs of both domestic and imported varieties; sells old varieties in bulk for natural plantings; specializes in miniatures. Retail cut flowers by mail.

J. H. DAVENPORT, P. O. Box 870, Invercargill, New Zealand. Is growing over a thousand varieties; issues a price list; local agent for Jefferson-Brown.

ALLEN W. DAVIS, 3625 S. W. Canby St., Portland, Oregon. A hobbyist at heart who issues a mimeographed list and is one of the best domestic sources for the smaller daffodils.

P. DE JAGER & SONS, INC., 188 Asbury St., So. Hamilton, Mass. The American office of an old Dutch firm; issues a large illustrated and descriptive bulb catalog; orders are filled in this country from imported stocks of English and Dutch varieties.

W. J. DUNLOP, Broughshane, Ballymena, Northern Ireland. A neighbor of the late Guy Wilson; issues illustrated and descriptive catalog featuring his own and Wilson's novelties; one of the major hybridizers of exhibition varieties.

S. A. FREE, No. 4 R. D., Tokomaru, Palmerston North, New Zealand. Has been hybridizing for many years and is prepared to supply some of his introductions to overseas growers but does not issue a list.

MURRAY GARDINER, Warragul South, Victoria, Australia. Supplies both retail and wholesale markets; hybridizer of exhibition varieties; publishes a list.

- GATEWAY GARDENS, LTD., Bromyard, Herefordshire, England. Issues a small list of novelties.
- J. GERRITSEN & SON, Voorschoten, Holland. Has a short general list but specializes in the new split-corona daffodils.
- J. N. HANCOCK & Co., Olinda Creek Rd., Kalorama, Victoria, Australia. Operated by son of founder who died in 1956. Began with stock of late H. A. Brown; descriptive catalog of over 1,000 varieties; hybridizes and has introduced many varieties; source for species and miniatures.
- R. E. HARRISON & Co., LTD., P. O. Box 1, Palmerston North, New Zealand. General nurserymen whose operations include standard varieties; large retail sales in window packages; general catalog.
- J. HEEMSKERK, c/o P. VAN DEURSEN, Sassenheim, Holland. Publishes a descriptive and illustrated catalog offering a range of standard varieties and moderately priced novelties, singly and by the dozen.
- W. JACKSON, Dover, Tasmania. Family business begun in 1920's by Dr. William Jackson; now operated by son, a retired M.P.; descriptive catalog; hybridizer with many excellent introductions; specializes in pinks.
- MICHAEL JEFFERSON-BROWN, Whitbourne, Worcester, England. One of the younger generation of British hybridizers; attractive illustrated and descriptive catalog; specializes in wide range of exhibition novelties.
- A. LADSON, Wandin North, Victoria, Australia. Illustrated and descriptive catalog offering a wide variety of standard and show flowers; hybridizes.
- J. S. LEITCH, 97 High St., Masterton, New Zealand. Acquired stock of late A. H. Ahrens; raises seedlings; price list.
- GRANT E. MITSCH, Canby, Ore. Leading American hybridizer with wide ranging interests; illustrated and descriptive catalog offering his own and the introductions of many other growers including American amateurs; his pinks and reversed bicolors have been widely acclaimed.
- TRAVERS MORRISON (Heathcote Nursery), Wandin, Victoria, Australia. Another second-generation business operated by son of Scott Morrison; hybridizer with many introductions; issues descriptive catalog.
- CHARLES H. MUELLER, River Road, New Hope, Pa. An importer of a good selection of standard and some novelty varieties from both Dutch and English growers; price list.
- H. J. OHMS, INC., P. O. Box 3, Newtown, Conn. 06470. A second-generation importer of Dutch bulbs; price list.
- P. PHILLIPS, Box 177, Otorohanga, New Zealand. Grows two acres for cut flowers and specializes in seedlings; has introduced several and holds stocks of J. T. Gray's latest releases; price list.
- MRS. J. LIONEL RICHARDSON, Waterford, Ireland. Continuing the work of her late husband who was one of the outstanding hybridizers of exhibition varieties; illustrated and descriptive catalog of Richardson and other novelties.
- MICHAEL SPRY, The Basin, Victoria, Australia. A leading professional exhibitor and raiser of most of the winning yellow trumpets exhibited in Victoria; issues a price list.
- R. C. A. TOMBLESON, Private Bag, Gisborne, New Zealand. Raises seedlings and exhibits them at principal shows; does not issue a list but is prepared to ship overseas.
- MARY MATTISON VAN SCHAİK, Cavendish, Vt. Mail order importer of Dutch bulbs offering standard varieties; price list.
- SVEN VAN ZONNEVELD, 456 Collegeville Road, Collegeville, Pa. American representative of Dutch firm; illustrated and descriptive catalog of standard varieties.
- WALLACE & BARR, Marden, Kent, England. Successors to Barr & Sons doing general nursery business, general catalog.
- GUY L. WILSON, LTD., Marden, Kent, England. A division of the de Jager business which purchased the Wilson stocks; continues to offer Wilson varieties, to introduce some of his seedlings, and to enlarge the Wilson list with other varieties.
- MATTHEW ZANDBERGEN, G. Zandbergen-Terwegen, Sassenheim, Holland. Wholesale and retail specialist with a good variety of the smaller daffodils on his list.

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To help more people enjoy the unique rewards of growing more and better daffodils, the Society issues publications, sponsors research, conducts an annual symposium of favored varieties, encourages local daffodil shows, and offers awards.

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<input type="checkbox"/> One year—family	7.50	<input type="checkbox"/> Life	100.00
<input type="checkbox"/> Three years—family	18.75	<input type="checkbox"/> Commercial—3 times any class	

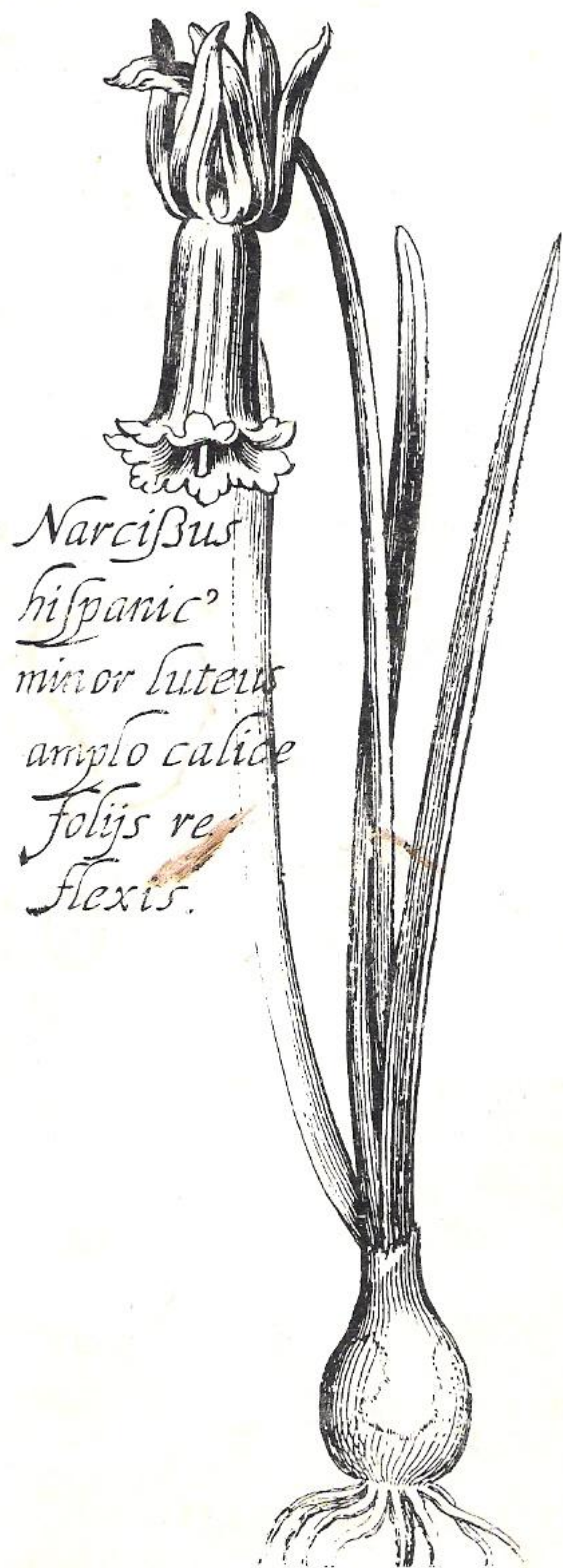
Application is made herewith for Membership in the American Daffodil Society.

MEMBERSHIP IN THE NAME OF.....

ADDRESS.....

CITY..... STATE..... ZIP CODE.....

REMITTANCE..... FOR..... YEAR(S). DATE.....



*Narcissus
hispanicus
minor luteus
amplo calice
folijs re-
flexis.*

PLATE 56

CYCLAMINEUS

Illustration from *Theatrum Florae* (1633) and used by De Candolle to describe the species.