



A close-up, slightly blurred photograph of a field of yellow daffodils with green leaves, serving as the background for the entire page. The flowers are in various stages of bloom, and the lighting is soft, creating a warm and natural atmosphere.

PART I

Flower Gardening from the Ground Up

*H*istory is unambiguous about the first English immigrants to America: They were a practical lot. They stuffed their pockets and pouches and trunks with the seeds of food and medicinal plants, not the seeds of ornamental plants. The hefty garden order shipped from England to John Winthrop Jr., in 1631, included only a handful of flowers. Such a hardheaded approach didn't last, of course. Within three decades of the Pilgrims' 1620 landing, the colonists were growing scores of ornamentals, including a bevy of eye-catching but largely impractical blossoms, such as bellflowers, candytuft, Canterbury bells, daffodils, gladioli, hollyhocks, snapdragons, and tulips.

Flower gardeners today—whether we tend a single window box or maintain a dozen beds and borders—are spiritual descendents of those pioneers. We are members of “Adam's profession,” bewitched by the ever-changing claims and bliss of growing flowers. Once you are seized by *furor hortensis*, as the Earl of Chesterfield described the delights of horticulture in 1751, your garden will give you, as his did him, “More pleasure than kingdoms do kings.” The true object of gardening, he wrote, is to enrich, not extend.

Flower gardens do enrich the lives of their makers. They are eternally interesting and rewarding, as well as challenging, demanding, and frustrating. And while the goal should be to enjoy and enrich, it doesn't take long before you will want to extend. The temptations are countless: a few more pots for the patio; a cold frame to get a head start in spring; a new bed of shade plants under the beech tree; and more.

November and December may slow *furor hortensis* in most parts of North America, but January brings seed and plant catalogs and the excitement of new cultivars, better weather, and bigger blooms. There's no resisting, and there's no end of fun. Welcome to the *familia hortensis*.



Spring Beauty. 'Apricot Beauty' and other Early Single Division tulips provide lush color to the home garden, especially when you use all plants of the same color. Poet Amy Lowell liked their erect bearing: "Marshalled like soldiers . . . the tulips stand arrayed."



CHAPTER ONE



The World of Flowers: Understanding Plant Basics

*I am not a greedy person
except about flowers and plants,
and then I become fanatically greedy.*

May Sarton, *Plant Dreaming Deep*, 1968

THERE IS A GARDENFUL OF PRACTICAL REASONS TO grow flowers: daffodils and irises to fill vases, chrysanthemums and pinks to fashion corsages, statice and strawflowers to make wreaths, nasturtiums and violets to garnish foods, bee balm and goldenrod to brew teas, marigolds and cosmos to produce dyes, lavender



Flowers as Models. *Calla lilies* (*Zantedeschia* spp.) are tender natives of southern Africa. Their striking blossoms have been as irresistible to artists as they are to gardeners.

and lilies to generate fragrance. There are flowers for drying and pressing, flowers for curing ills, flowers for attracting bees, birds, and other wildlife, flowers for turning children into gardeners, vining flowers for screening out the neighbors, and more.

With so many hardheaded incentives, don't forget that flowers are inherently lovely, worth growing solely for themselves. Artists and poets, the keenest of seers, have always known that "beauty is its own excuse for being," as Ralph Waldo Emerson phrased it more than 150 years ago. It's not an accident that most great painters, both Western and Eastern, have used flowers as subjects. Just a fragmentary list of those who have recreated blooms on paper or canvas includes Renoir, Manet, van Gogh, Cézanne, Matisse, Chagall, Dali, Warhol, Yun Bing, and Hokusai.

In addition to roses, which are the preeminent floral posers, artists have been seduced often by irises, lilies, sunflowers, daisies, tulips, chrysanthemums, and dahlias. American artist Georgia O'Keeffe is reputed to have said that she hated flowers and painted them only because "they're cheaper than models and they don't move." Her comment surely was facetious, for her reputation stands in part on her provocative calla lily portraits. Perhaps Marc Chagall was closer to the truth when he wrote, "Art is the unceasing effort to compete with the beauty of flowers and never succeeding."

Flowers have interested and inspired writers as well. Medieval literature is littered with flowers, as are Chaucer's *Canterbury Tales* and Shakespeare's plays; the Romantic poets' focus on flowers was second only to their obsession with matters of the heart. Flowers appear as crucial symbols in the works of Hawthorne, Poe, Faulkner, and other major American

OFFICIAL FLORICULTURE

Flowers have served as national symbols for centuries: the rose in England, the *fleur-de-lis* in France, the chrysanthemum in Japan. The tulip is the official flower of the Netherlands, despite being a native of the Middle East and Central Asia, and orchids are symbolic of a half dozen South and Central American nations. Mexico's flower is the dahlia, Finland's is the lily-of-the-valley (*Convallaria majalis*), and the Flanders, or corn, poppy (*Papaver rhoeas*)

represents both Belgium and Poland. The lotus (*Nelumbo* spp.) is the official flower of India, and if you've seen *The Sound of Music*, it comes as no surprise that Austria's national flower is edelweiss (*Leontopodium alpinum*). Although the historian-critic Lewis Mumford quipped that the American national flower was "the concrete clover leaf," in fact, it is the rose, designated officially in 1986.

writers, and they even figure in popular mysteries, most famously in the books by Rex Stout, whose detective Nero Wolfe is a dedicated orchid grower.

Mythology, too, teems with flowers. In a Persian narrative, the first tulip springs from the spot where a distraught lover jumped to his demise. English folklore is more benign vis-à-vis tulips, which were reputedly used by pillywiggins (fairies that tend spring flowers) as cradles for their babies. According to Hindustani legend, the tulip immersed itself in blood while in a jealous passion, which explains the

FLOR, FLORA, FLOWER

The flora half of flora and fauna comes from *flor*, “flower” in Latin. Flora was the Roman goddess of spring flowers and “all that flourishes.” She was celebrated in spring at *Floralia*, a licentious festival featuring X-rated art and naked women. Flora’s partner, fauna, refers to Faunus, the Roman god of animals, the fields, and shepherds. In Greece, Faunus was known as Pan, a pipe-playing, fun-loving god depicted as half man and half goat.



Flowers on Paper. Botanical illustrations of tulips, like this drawing by Crispijn van de Passe the Younger labeled “*Tulipa bononiensis*,” helped create the wildly speculative bulb market in 17th-century Holland known as “*Tulipomania*.”

red markings, or wound, that many tulips carry in their centers.

Peonies and chrysanthemums recur in Chinese and Japanese myths, and European mythology brims with flowers. Dozens of accounts attribute the common name of various *Myosotis* species—forget-me-nots—to foolhardy lovers drowning in rivers while trying to pick flowers for their ladyloves. “*Vergiss mich nicht*,” calls out a German knight about to go under for the third time, “Do not forget me.” And scores of classical myths revolve around irises, narcissi, crocuses, daphnes, asters, peonies, and hyacinths, to list only a few species.

The link between words and flowers reached an apex in the Victorian era with the “language of flowers,” a *lingua botanica* that assigned character traits and emotions to specific blossoms. Sending a *tussie-mussie*—a circular bouquet jam-packed with flowers—also sent a message of love, sympathy, or another sentiment. Scores of “flower dictionaries” were published; cosmos, for example, stood for modesty; hosta for devotion; narcissi, egotism; violets, modesty and faithfulness. No flower was without an attribute, and most had many attributes, making it necessary for recipients of tussie-mussies to read between the petals.

To the amazement of many, books about the language of flowers continue to be published. Such books may seem hopelessly outdated, but *Tussie-Mussies: The Victorian Art of Expressing Yourself in the Language of Flowers* (1993) is one of many titles that preserves the genre, even updates it with suggested flower combinations for communicating “support during a difficult divorce” and “congratulations on a successful diet.”

Blessed Be the Names

The common names of flowers—the North Carolina garden writer Elizabeth Lawrence called them “sweet country names” in *Gardening for Love* (1987)—always carry a story. In Scandinavia, for instance, legend has it that foxbells once rang out warnings to foxes that they were in danger. The mysterious peals so frightened hunters that they stopped killing foxes, and thus the gods removed the clappers from the bells, rendering the flowers silent.

It would be fun to fill a flower bed on the basis of common names alone, perhaps a small plot bursting not only with foxbells, but with witch’s thimbles, goblin gloves, lushmore, fairies’ petticoats, Virgin’s fingers, lion’s mouth, popdocks, fairy caps, rabbit flower, throatwort, and Pan’s sweethearts. Plant them all, though, and the bed would contain only one flower, the common foxglove (*Digitalis purpurea*).

Foxglove’s many aliases highlight a problem with common names: Most flowers have more than one.



Plant Names. The foxglove’s genus name, *Digitalis*, refers to a chemical in its leaves that stimulates the heart. Though safe when prescribed by a physician, *digitalis* never should be self-prescribed.

Worse still, the same common names are used for different flowers. When British gardeners talk about daisies, they are referring to the English daisy, a low-growing perennial that blooms in late spring. Americans using the same term are likely to be thinking of a 3-foot Shasta daisy (*Leucanthemum × superbum*), one of Luther Burbank’s most enduring breeding successes. Or they may have ox-eye daisy in mind, those intrepid roadside flowers, or golden Marguerites, or Michaelmas daisies, or Swan River daisies, or Transvaal daisies, or any of a dozen other daisylike flowers.

To identify who’s really who, it’s important to know something about scientific names, the tongue-tangling appellations that tend to intimidate new gardeners (and more than a few experienced ones). Scientific names—also referred to as botanical names, Latin names, and Latin binomials—are the gold standard, the internationally accepted names for plants. One plant, one name, any time, any place.

For centuries scientists tried to agree on how to classify and name plants but didn’t achieve a consensus until the Swedish naturalist Carolus Linnaeus came along with his binomial system. Linnaeus based naming on his understanding of plants’ reproductive parts, an approach that scandalized conservatives, but his system nevertheless was accepted in 1753. In the Linnaean scheme, all plants are members of the kingdom *Plantae*, one of the five basic groups of living things, then distributed in increasingly smaller categories: division, class, order, family, genus, and species.

In the garden, every plant goes by at least two Latin or Latinlike names: a *genus name* and a *species name*, or specific epithet. (A genus is a group of similar plants within a family; a species is a distinct plant within the genus.) For example, the genus name for all poppies—and there are dozens—is *Papaver*, a word that comes from Latin. The opium poppy is one type, or species, of poppy. Its species name is *somniferum*, which means “sleep-producing.” So the opium poppy’s full scientific name is *Papaver somniferum*. (The second time it’s written in a text, it becomes *P. somniferum*.) In print, scientific names are set in italics or underlined, with the genus name capitalized. *Papaver* spp. is shorthand for referring to all the species in the poppy genus. Species names often refer to a characteristic of the plant: its origin, its discoverer, its color, or some other quality. *Viola biflora*, twin-flowered violet, has *biflora*, or paired, yellow flowers, while *V. tricolor*, Johnny-jump-up, has flowers of three colors: yellow, blue, and purple.

Just as different flowers have the same genus name—there are hundreds of different lilies, or *Lilium* species—flowers from different genera can have the same species name (or variation of the name). There's not only *Viola odorata* (sweet violet) but *Oenothera odorata* (sweet sundrops) and *Reseda odorata* (mignonette). *Odorata* and its variants mean “fragrant,” so any flower with a form of *odorata* in its name, like *Lathyrus odoratus*, or sweet pea, should smell good.

Most garden flowers have a third, or *cultivar*, name, which is placed in single quotation marks, such as *Papaver somniferum* ‘White Cloud’. A cultivar—gardeners often call them varieties, although botanists make distinctions between cultivars and varieties—is usually a plant that has been developed by people rather than by Mother Nature. (The term *cultivar* is short for cultivated variety; the abbreviation “cvs.” stands for cultivars.) Cultivars must differ in some way from the species. ‘White Cloud’, for example, is an opium poppy with double white flowers, while ordinary opium poppies, plain old *Papaver somniferum*, have single flowers not only in white but also in shades of pink, purple, and red.

The point of all these taxonomic tags—*taxonomy* is the science of classifying plants, and the people who do the work are called *taxonomists*—is to ensure that gardeners are planting the flower they think they're planting. It's worth trying to learn flowers' scientific names. Plants like petunia and zinnia, whose genus name is the same as their common name, are easy. Other scientific names can be a real chore to remember.

One last note: Scientific names aren't eternal. As botanists make new discoveries about known



Bigger and Better. The opium poppy, *Papaver somniferum* ‘Peony Flowered’, gets its cultivar name from its large, frilly blooms, which resemble those of double peonies.

plants, taxonomists sometimes change their scientific names according to the rules set down in the *International Code of Botanical Nomenclature*. Common morning glory, for example, was *Convolvulus purpureus* and *Pharbitis purpurea* before it became *Ipomoea purpurea*. Fortunately, name changes don't occur every day. Chrysanthemum is another genus with more than one alias.

Life Style

While not all plants blossom—ferns are a notable example—most plants do produce flowers, including trees, woody shrubs and vines, and *herbs*, the omnibus word for plants with soft rather than woody stems. Flower gardeners spend most of their time with herbs, or *herbaceous plants*, which they often group on the basis of how long they live. (Trees and woody plants are outside the scope of this book.)

ANNUALS

Annuals are herbaceous plants that have, as American writer Richardson Wright put it, “a short life and a merry one.” Bachelor’s buttons (*Centaurea cyanus*), cosmos, marigolds, zinnias, and other annuals do everything in one garden season: They germinate or sprout, bloom, produce seeds, and die. All their energy is directed toward bringing forth seeds to produce the next generation before they are killed by the cold.



Easy Annuals. Zinnias are one of many undemanding, sun-loving annual flowers. Gardeners can choose from hundreds of brilliantly colorful cultivars if they start with seeds rather than purchase nursery-grown plants.

Traditionally, garden writers have been dismissive of annuals—too easy to grow, too bright, too common—but annuals are useful and handsome flowers. They have a long bloom time, are less expensive than perennials, and provide instant gratification. There are annuals for every inclination: subtle and gaudy hues, ground creepers and climbers, big and small blooms, intricate and simple forms. There are annuals for dry and wet spots, for large and small spaces, for sun and shade. Most annuals are simple to cultivate, but there is a smattering of demanding species for gardeners seeking a challenge.

BIENNIALS

There aren’t many herbaceous *biennials*, plants with lives that extend over two growing seasons. Canterbury bells (*Campanula medium*), common foxglove (*Digitalis purpurea*), money plant (*Lunaria annua*), and other biennials germinate and produce foliage and strong roots the first year, then go dormant. The second year they resprout, flower, set seeds, and die.

That two-season life cycle isn’t written in stone. If seeded very early, some biennials will bloom in their first year. Many biennials reliably *self-seed*—drop seeds in the garden that will sprout the next

A PLACE TO BEGIN

Annuals aren’t foolproof plants, but most are easy to grow and reward their growers with colorful blooms that keep coming throughout the garden season. If you’re new to gardening, begin with some of these nearly foolproof flowers.

Ageratum (*Ageratum houstonianum*)
 Annual phlox (*Phlox drummondii*)
 Calliopsis/plains coreopsis
 (*Coreopsis tinctoria*)
 Cockscomb (*Celosia argentea*)
 Cosmos (*Cosmos bipinnatus*, *C. sulphureus*)
 Impatiens (*Impatiens walleriana*)
 Marigolds (*Tagetes* spp.)
 Moss rose (*Portulaca grandiflora*)
 Nasturtium (*Tropaeolum majus*)
 Petunia (*Petunia* × *hybrida*)
 Spider flower (*Cleome hassleriana*)
 Sweet alyssum (*Lobularia maritima*)
 Zinnias (*Zinnia* spp.)

SPEED DEMONS

Some annuals grow so quickly that there's no need to start them indoors or to buy plants at the garden center. These are a few of the annuals that can be sown in most gardens right where they'll flower. Rough up the soil a bit to provide a seedbed, but don't forget that most annuals need only average soil: Pour on the fertilizer, and you'll get elephantine plants and no flowers.

Calliopsis/plains coreopsis (*Coreopsis tinctoria*)

Cosmos (*Cosmos bipinnatus*, *C. sulphureus*)

Marigolds (*Tagetes* spp.)

Morning glory (*Ipomoea tricolor*)

Nasturtium (*Tropaeolum majus*)

Night-scented stock (*Matthiola longipetala*)

Pot marigold (*Calendula officinalis*)

Snow-on-the-mountain (*Euphorbia marginata*)

Sunflower (*Helianthus annuus*)

Sweet alyssum (*Lobularia maritima*)

Zinnia (*Zinnia elegans*)

spring—so that you may never have to replant even though your original plants die.

PERENNIALS

The word *perennial* comes from the Latin for “perpetual” or “enduring.” Herbaceous perennials aren't always perpetual, but they are plants that live three years or more in the right climate. (The adage about

perennials is: “The first year they sleep, the second they creep, the third they leap.”) Perennials are the meat-and-potatoes of most flower borders, dying to the ground in winter in cold regions but faithfully resprouting in spring. These flowers, as the poet and son of a Michigan nurseryman Theodore Roethke wrote, “deep in their roots . . . keep the light.”

As a rule, perennials bloom for a shorter time and produce fewer seeds than annuals and biennials do.

They're more difficult to grow from seed, but their flowers also have more complicated shapes and forms and subtler colors. Their leaves also have more varied shapes and textures. It is this visual diversity—and the fact that there are perennials that will flourish in all settings and conditions—that makes vigorous plants like fern-leaf yarrow (*Achillea filipendulina*), purple coneflower (*Echinacea purpurea*), and daylilies so popular with gardeners.

Being perennial and being *hardy* are not the same thing. (For more information about plant hardiness, see Chapter 2, page 29.) Perenniality is a matter of genetics, while hardiness refers to a plant's ability to survive in a particular climate. Still, most perennials are flowers you can



Garden Stalwarts. Hybrid peonies with single blooms need less support than double-flowered cultivars. Few perennials can match the peony's elegant beauty, its usefulness in beds and borders, its handsome foliage, or its longevity in the garden.

W FOREVER FLOWERS

ell, maybe not forever, but very long-lasting. These perennials—given the right conditions and proper care—should be around for decades. That's longer than most garden tools last, and even some gardeners.

Astilbes (*Astilbe* cvs.)
 Bleeding heart (*Dicentra spectabilis*)
 Daylilies (*Hemerocallis* cvs.)
 Gas plant (*Dictamnus albus*)
 Hardy geraniums/cranesbills (*Geranium* spp.)
 Hostas (*Hosta* cvs.)
 Monkshoods (*Aconitum* spp.)
 Peonies (*Paeonia* cvs.)
 Purple coneflower (*Echinacea purpurea*)
 Ragged coneflower (*Rudbeckia laciniata* 'Golden Glow')
 Sedums/stonecrops (*Sedum* spp.)
 Yarrow (*Achillea filipendulina*)

depend on and are easy to cultivate and willing to grow and increase without pampering. While a few species called *short-lived perennials* conk out in two or three seasons, most perennials live for many years. A few have octogenarian genes and are likely to outlast those who plant them. The hardest part of growing perennials is curbing your enthusiasm: You'll want one of everything.

BULBOUS FLOWERS

The word *bulb* is used by gardeners to refer to any of the flowers that grow from specialized underground structures. (The formal term for any bulbous plant is geophyte.) All bulbous plants have a *dormant period*, a time when they aren't actively growing. It can be during cold or hot weather, depending on the plant and the location. Most bulbous plants return year after year if they have the right conditions and receive good care.

True bulbs, such as tulips and lilies, are made up of food-storing fleshy scales, tightly joined in some plants, more loosely packed together in others. Roots grow from the wider end. Each bulb contains an undeveloped plant, or embryo, as well as stored food to support its growth. Many bulbs multiply underground and can be dug, separated, and replanted elsewhere. Most hardy bulbs must be planted in the fall; they flower in the spring.

Corms look much like bulbs and store food, but they are actually swollen underground stems, solid inside rather than layered or scaled. At the end of the garden season, the corm dries up and a new corm forms just above the old one at the base of the stem. Corms also produce offsets called *cormels*, which will produce flowering plants in 2 or 3 years. Like true bulbs, corm roots grow from the wider end. Some species of gayfeathers (*Liatis* spp.) grow from corms, as do crocuses and gladioli.

Rhizomes are specialized food-storing stems that grow horizontally, either underground or along the surface of the soil, and produce both roots and shoots. Bearded iris are the most familiar rhizomatous

F FALL FUN

Hardy spring bulbs are among everyone's favorites and among the easiest flowers to grow—in most cases you can plant them and forget them. These are some of the colorful spring bloomers that you need to plant when the leaves begin to turn in order to have flowers in the spring.

Checkered lily (*Fritillaria meleagris*)
 Crocuses (*Crocus* spp.)
 Crown imperial (*Fritillaria imperialis*)
 Daffodils (*Narcissus* cvs.)
 Glories-of-the-snow (*Chionodoxa* spp.)

Grape hyacinths (*Muscari* spp.)
 Grecian windflower (*Anemone blanda*)
 Hyacinth (*Hyacinth orientalis*)
 Siberian squill (*Scilla siberica*)
 Snowdrops (*Galanthus* spp.)
 Spanish bluebell (*Hyacinthoides hispanica*)
 Spring starflower (*Ipheion uniflorum*)
 Stars-of-Bethlehem (*Ornithogalum* spp.)
 Tulips (*Tulipa* cvs.)
 Winter aconite (*Eranthis hyemalis*)

garden flower; they have thick, fleshy rhizomes that grow slowly and create dense plant clumps. Lily-of-the-valley (*Convallaria majalis*) is also rhizomatous, but its long, thin rhizomes—which are dug and sold as *pips*—race through the soil, producing new plants as they go. Plants with rhizomes that can be dug and stored without soil are often sold with bulbs and corms. Gardeners propagate, or create, new plants by cutting the rhizome into pieces.

Tuberous plants include both species that grow from stem tubers, such as tuberous begonias and cyclamens, and flowers like dahlias that grow from tuberous roots. The botanical differences aren't terribly important to home gardeners, except to know that stem tubers have eyes, or buds, like a potato's; a piece of tuber that has at least one eye will produce a new plant. Plants with tuberous roots have buds located at the top of the tuber, so any tuber segment must be attached to a piece of the *crown*—the place where the roots and stem join—for it to produce new plants.

Point of Origin

No one disputes that *angiosperms*, or flowering plants, are both the youngest and largest plant group on earth, but the experts do disagree on how many angiosperms there are. Prominent botanists recently have estimated that the total is at least 425,000 flowering trees, shrubs, and herbs, nearly twice the traditionally cited number of 235,000. Add subspecies, varieties, cultivars, and the new species discovered each year (2,000 or more), and the sum is even greater.

About two-thirds of these flowering species are tropicals, plants that originate between the Tropic of Cancer and the Tropic of Capricorn, the belt that circles the middle of the globe. The rest occur in temperate areas, either north or south of tropical latitudes. Where people were born



Opening Day. 'February Gold' and other hardy daffodils signal the beginning of the garden season. The United States now imports nearly 110 million narcissus bulbs from Holland each year, and thousands more are grown domestically.

isn't all that important (unless they want to be president); once they invest in a winter wardrobe, those who got their start in life in southern Florida can live just fine in northern Minnesota. In contrast, tropical

ONE LEAF OR TWO?

Botanists recognize two subclasses of angiosperms based on the number of seed leaves, or cotyledons, the plant has: *Monocotyledons* have one, *dicotyledons* two. (Cotyledons are the embryonic leaves contained in a seed and normally are the first leaves to appear when a seed sprouts.) There are other differences. Monocotyledons, or monocots, such as lilies and daffodils, tend to have fleshy or fibrous roots or grow from bulbs or bulblike organs; to have long, narrow leaves with parallel veins and little or no leaf stalk; and to have flower parts in multiples of three. Dicotyledons, or dicots, including geraniums (*Geranium* spp. and *Pelargonium* spp.), peonies, and phlox, are likely to have taproots or fibrous roots; to have broad or compound leaves with net-veining; and to have leaf stalks. Dicotyledonous flowers typically have flower parts in fours or fives.

plants that call Miami, Florida, home are unlikely to adapt to the conditions in Duluth, Minnesota, where January's mean temperature is 8.5°F, shockingly cold compared with Miami's mean of 67.3°F. Geography is critical to plants: Where they originate—where they are *native*—largely determines where else they can grow or, at the least, how gardeners must treat them. There are no reliable fur coats for plants.

A majority of our favorite garden plants are travelers, not native-born Americans but “green immigrants,” to borrow the title of a book by Claire Shaver Haughton. Brought here both intentionally and unintentionally, many of these exotic, or *non-native*, species have made themselves at home in North America and live happily in our beds and borders. Foxglove (*Digitalis purpurea*), tulips, daffodils, daylilies, petunias, cosmos—they're all immigrants. “My flowers are near and foreign,” the American poet Emily Dickinson wrote to a friend in 1866, “and I have but to cross the floor to stand in the Spice Islands.”

Some species here on green cards have adapted too well. Freed from natural competition and controls, they jumped the garden fence and naturalized in the wild so enthusiastically that they now threaten native plants and ecosystems. Purple loosestrife (*Lythrum salicaria*) is one; its spikes of colorful blooms are undeniably pretty, but it has become a floral menace from the East Coast to the West. Noninvasive garden substitutes for purple loosestrife include spike gayfeather (*Liatris spicata*), Chinese astilbe (*Astilbe chinensis*), spike speedwells (*Veronica spicata* ‘Red Fox’ and other cultivars), hybrid sage (*Salvia × sylvestris* ‘Rose Queen’), and tree mallow (*Malva sylvestris* ‘Zebrina’).

If some flowers make themselves too much at home, others balk in new environments and must be grown differently from the way they grow in their natural settings. *Impatiens walleriana*, the primogenitor of most of our garden impatiens, is a perennial

PLANT HUNTERS

Plant hunters, who deserve credit for many of our favorite garden flowers, are among the most interesting figures in history. Humans have been moving plants from one location to another since the dawn of time, but written records go back only to 1495 B.C., when an Egyptian queen imported frankincense trees from what is now Somalia. The settlement of North America was accompanied by a rush in botanical travelers, both to the New World from the Old and from the New World to the Old. The greatest contribution that can be made to any nation, Thomas Jefferson wrote, “is to add a useful plant to its culture.”

Perhaps the most determined plant collector on record was the Englishman E. H. Wilson, who later became the director of the Arnold Arboretum in Boston, Massachusetts. So devoted was Wilson that he nearly died in China after finding the fragrant regal lily (*Lilium regale*). Wilson survived infection and other complications when a boulder smashed his leg in 1910, but he was left crippled with what he referred to as his “lily limp.” Despite his handicap, he collected and introduced more plants—about 3,000 species—than anyone else in history.

W

BOTANICAL BULLIES

While no garden need contain only indigenous plants, some exotic species have proved so aggressive that responsible gardeners don't grow them. Many of the worst invasive species are woody plants. Perhaps the worst of the worst is kudzu (*Pueraria lobata*), which was brought to the United States from Japan by Thomas Hogg in the late 19th century. It quickly escaped from cultivation and is now known as "the vine that ate the South."

While there is every reason to be cautious, species that are invasive in one region may not be invasive everywhere. Baby's breath (*Gypsophila paniculata*), for example, is a pest on the West Coast but is well behaved in New England. Consult local conservation organizations to determine which exotic flowers (and other plants) are treacherous in your region. Most states maintain lists of species that should not be grown. Among North America's potential floral villains are:

Baby's breath (*Gypsophila paniculata*)
 Bachelor's button (*Centaurea cyanus*)
 Canada thistle (*Cirsium arvense*)
 Common mullein (*Verbascum thapsus*)
 Common toadflax (*Linaria vulgaris*)
 Crown vetch (*Coronilla varia*)
 Dame's rocket (*Hesperis matronalis*)
 Globe centaurea/giant knapweed (*Centaurea macrocephala*)

Madagascar periwinkle (*Catharanthus roseus*)
 Mugwort (*Artemisia vulgaris*)
 Nodding thistle (*Carduus nutans*)
 Ox-eye daisy (*Leucanthemum vulgare*)
 Periwinkle/myrtle (*Vinca major*, *V. minor*)
 Purple loosestrife (*Lythrum salicaria*)
 Scotch broom (*Cytisus scoparius*)
 Sulfur cinquefoil (*Potentilla recta*)
 Tawny daylily (*Hemerocallis fulva*)



Roadside Blooms. Ox-eye daisies (*Leucanthemum vulgare*) may seem like quintessential American flowers, but in fact they are floral expatriates from Europe and Asia that have naturalized with great success throughout North America.

in its native East Africa. It's also perennial in balmy San Clemente, California, but in Kansas and other places where winters are cold, gardeners must handle impatiens as if they were annuals. Similarly, dahlias, natives of Central America, can stay in the ground year after year in places where the mercury doesn't go below 32°F; but in Montana, gardeners must dig dahlia tubers and store them indoors over the winter.

While winter temperature is the most important factor in how we grow plants that aren't native to a region, it's not the only consideration. Mobile, Alabama, and Tucson, Arizona, have similar mean temperatures in January—about 51°F—but Mobile receives an average of nearly 5 inches of rain during that month, while Tucson gets less than 1 inch. Desert species from Asia may thrive in Tucson, but they won't thrive in Mobile. Other factors that influence how a plant adapts—or doesn't adapt—include how humid or hot it gets in summer, what are the nighttime temperatures, and how long the sun shines during the growing season.

How do you know if a flower labeled “perennial” will be perennial in your garden or whether you can leave a bulbous plant in the ground over winter? First, check the information in Plant Portraits, which begin on page 213. Ask other gardeners in your neighborhood, and don't be shy about quizzing the people at local nurseries and garden centers. Your USDA Hardiness Zone rating and microclimate are additional guides to whether or not a flower will thrive in your garden. (See Chapter 2, page 29, for information about hardiness zones and microclimates.) Watch, too, for the climate-related terms used in garden books and on plant labels. (One warning: The words *tender* and *hardy* don't have anything to do with whether or not a plant is easy to grow, long-lived, or pest- or disease-resistant. They have to do with how sensitive a plant is to cold.)

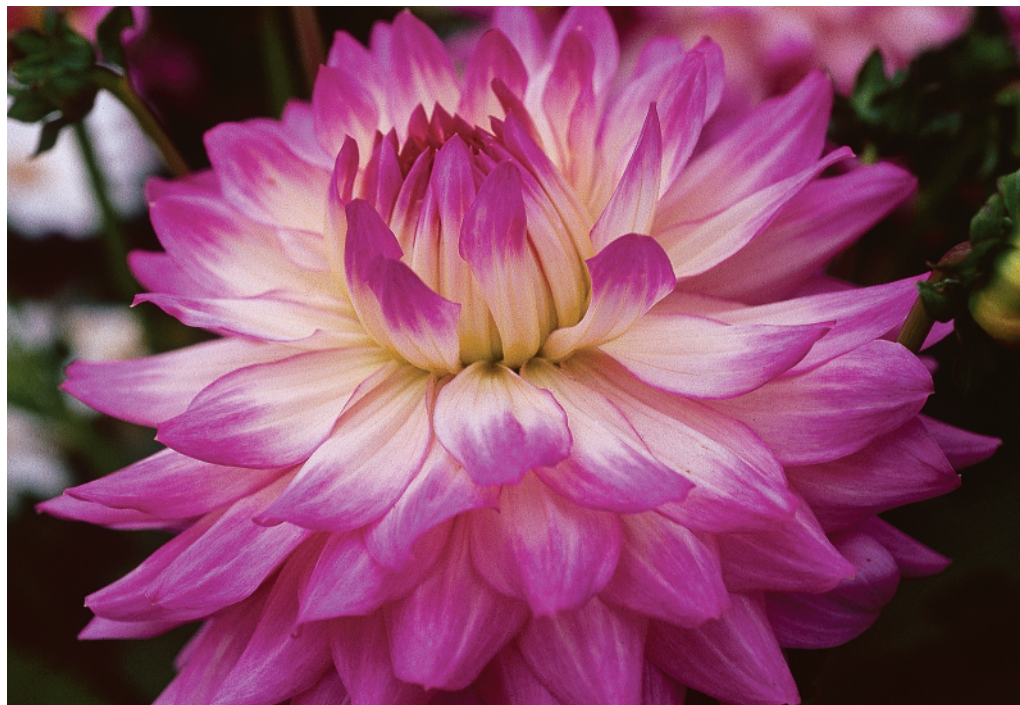
Terms to Grow By

What does all this mean when you're pushing a cart through a garden center or perusing the pages of a mail-order catalog? Understanding a few commonly used terms will help you sort through all the tempting offerings.

Hardy perennials are flowers that are able to grow outside all year round in most North American gardens. Goat's beard (*Aruncus dioicus*), daylilies, and garden phlox (*Phlox paniculata*) are good examples.

Tender perennials, in contrast, can grow outside all year in mild climates but not in cold regions where the ground freezes. Wax begonias (*Begonia semperflorens*), black-eyed Susan vine (*Thunbergia alta*), and petunias persist in warm regions, but don't expect them to reappear in spring in frosty realms. Tender perennials often are tagged with the phrase “perennial grown as an annual.”

Cool-weather annuals, also called hardy annuals, are annual species—such as bachelor's button (*Centaurea cyanus*), sweet alyssum (*Lobularia maritima*), snapdragon (*Antirrhinum majus*), and sweet peas (*Lathyrus odoratus*)—that prefer cool conditions;



Tender Treasure. This 'Karma Amanda' dahlia has long-lasting blooms. Bred especially for cutting, its tubers, like those of other dahlias, must be overwintered indoors in cold regions, then replanted outdoors in spring.

some are able to survive light frosts. They may die out when the mercury climbs in warm climates but will continue to flower all summer in gardens where temperatures are more moderate.

Warm-weather annuals, or tender annuals, such as cockscomb (*Celosia argentea*), scarlet sage (*Salvia splendens*), and flowering tobacco (*Nicotiana glauca*), thrive in heat and are sensitive to even a whisper of frost. Some annuals fall in the middle, between these two extremes, and they're sometimes referred to as half-hardy annuals. These, including strawflower (*Bracteantha bracteata*), spider flower (*Cleome hassleriana*), and baby's breath (*Gypsophila elegans*), do best in warm but not torrid conditions.

Hardy bulbs—flowers such as daffodils, crocuses, and many lilies—tolerate very cold winters. They are grown as perennials in temperate climates, left in the ground to resprout in spring.

Tender bulbs, in contrast, can't endure gelid winters. In all but the warmest parts of North America, these natives of tropical and subtropical regions must be treated as if they were annuals and replaced each year or grown as tender perennials and dug and overwintered indoors. Dahlias, cannas, tuberous begonias (*Begonia tuberhybrida* hybrids), and gladioli are examples of tender bulbs.

One last point: Labels like "tender" or "cool weather" don't just tell what kind of protection from cold a plant might need. They also signal that you may need to give a plant shade during the hottest part of the day, or extra water, or that you must start it indoors, long before it is warm enough to plant it outside. What a plant needs depends on where it was from and where *you* are located. Like politics, all gardening is local.

Botany Basics

Experienced gardeners know more than the names of the flowers they grow. They know about plants themselves. Botanists can tell you that African marigolds (*Tagetes erecta*) have leaves that are "pinnate, narrowly lanceolate to lanceolate, acute, sharply toothed," but that sort of detail isn't a prerequisite to or a guarantee for growing healthy African marigolds. Knowing all the terms for foliage and flower shapes and margin and vein patterns is a worthy accomplishment, but it's not the place to begin. A

little basic anatomy is more useful: roots, stems, and leaves. If you have all three, you have a living plant.

ROOTS

It's easy to forget about roots. They're usually below ground and out of sight, yet they are as crucial as a plant's visible parts. They not only fasten the plant in the soil and support the stem but also take up minerals and water, largely through their tips and hairs, which are then moved up through the plant. They store food for the plant to use in the future. "Young buds sleep in the root's white core," John Keats wrote in 1818, which is a line from "Faery Song I" that proves the poet was also a botanist.

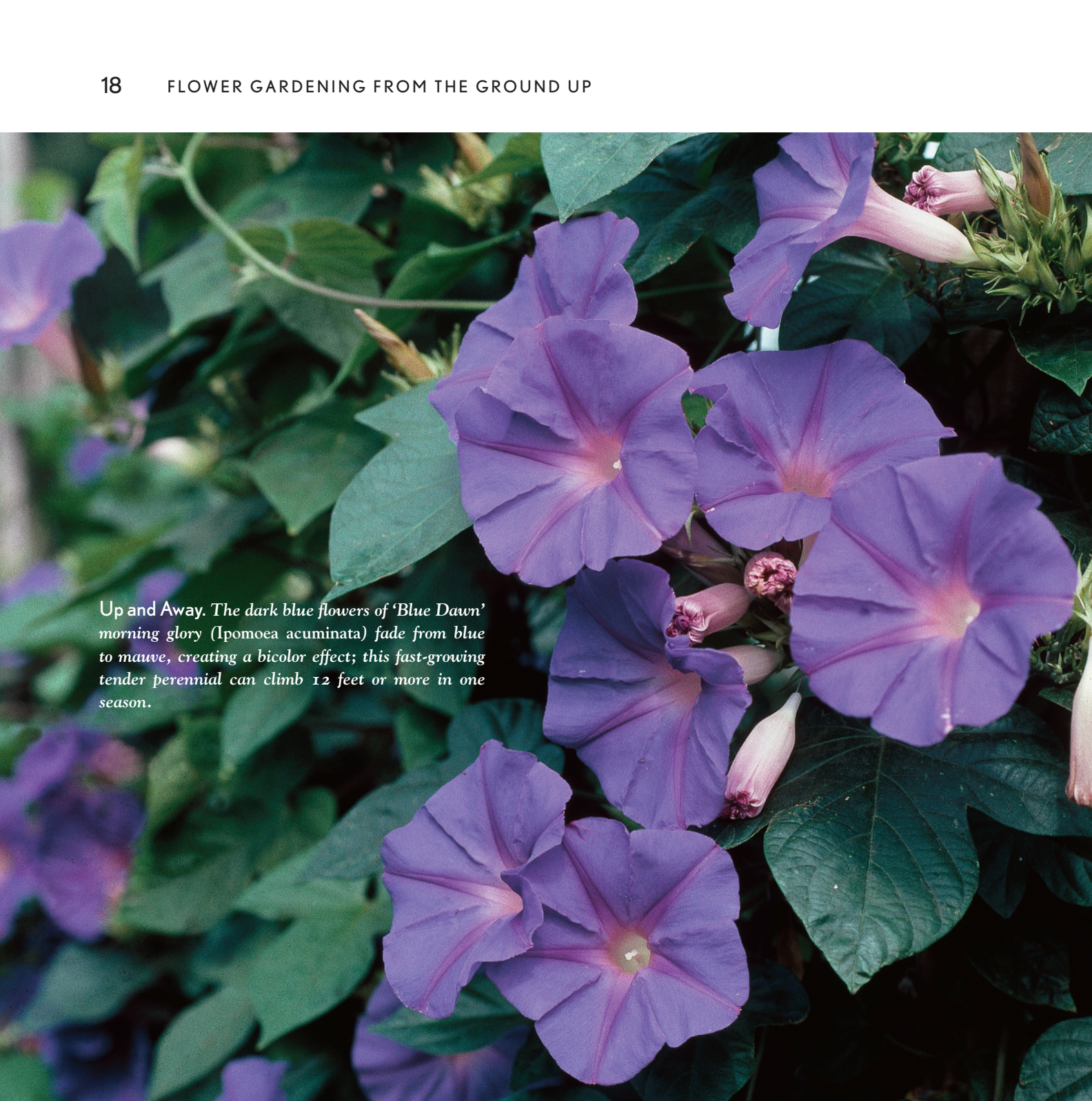
Garden flowers typically have one of two root systems: tap or fibrous. *Taproots* are fleshy and generally long and unbranched. Typically, they're shaped something like a carrot, which is an edible root, but they also may be branched. Taproots plunge deep into the earth, giving the aboveground plant resistance to drought and wind. Mature flowering plants with taproots, such as globe thistle (*Echinops ritro*), Oriental poppy (*Papaver orientale*), and sea holly (*Eryngium maritimum*), are difficult to transplant and nearly impossible to *divide*, or separate, into several plants.

Most garden flowers have *fibrous roots*, which makes them relatively easy to transplant or to propagate by dividing. Fibrous roots grow more out than down and are well branched. The roots can be thin, even stringy, or thick and fleshy, as is the case with daylilies. And there can be lots of them: The world record is held by a single winter rye plant with roots that totaled 387 miles in length.

Roots cannot produce leaves, but they can sprout more roots and stems. As long as a plant is alive, its roots keep growing, always on the lookout for moisture and food. Like things living aboveground, roots need oxygen and will survive only where it's available. If the soil is too wet or too compacted, most roots suffocate and die. The better its root system, the better a plant grows. "Good roots, good plant" is country wisdom based in science.

STEMS

Stems are the plant's plumbing, carrying water and nutrients to the leaves and sugars back to the roots. And they bear the plant's *buds*, which are



Up and Away. The dark blue flowers of 'Blue Dawn' morning glory (*Ipomoea acuminata*) fade from blue to mauve, creating a bicolor effect; this fast-growing tender perennial can climb 12 feet or more in one season.

undeveloped shoots, as well as leaves and flowers. Stems vary widely and can be round or square, smooth or hairy. Some stems stand erect like plebes at attention; others sprout at an angle; and the stems of vines are limber and require support. A few flowers have underground or ground-hugging stems, but

most flower stems are aboveground, upright, fairly rigid, and easy to see.

Also visible are the stem *nodes*, the irregular joints along the stems where shoots, leaves, and flowers are attached. Each stem has an *apical bud*, a bud located at its tip, that not only controls how

long a stem grows but influences the development of the *lateral buds* that form along the stem. Gardeners often pinch off the apical bud on plants to encourage lateral buds to sprout and produce a bushier plant.

Internodes are the stem segments between the nodes. Every species has its own genetic instructions as to the length of the internodes, and thus the length of the stem. Vining species like morning glories (*Ipomoea* spp.) have long stems, while other flowers, such as some *Sedum* species, have short ones. Stem length is affected by growing conditions as well as DNA. Plants that get too little light, for instance, produce long, spindly stems. (Rhizomes, which may be aboveground or below, technically are stems, not roots, since they have nodes, internodes, and buds.)

LEAVES

Leaves, as elementary school teachers like to say, are food factories. Through magic called *photosynthesis*, leaves make the sugars and other compounds that plants need to grow. Photosynthesis requires light,

chlorophyll, carbon dioxide, and water, and leaves are engineered either to have or to obtain all four. Designed to catch light, most leaves are flat and positioned to avoid being shaded by other leaves on the plant. They have pores, primarily on their undersides, which allow them to take in carbon dioxide, to emit oxygen, and to regulate water loss.

What's important to the gardener is that photosynthesis is vital to a plant's ability to develop, to produce flowers, and even to survive. Cut off a lily's stalk or a daffodil's leaves before they wither and their bulbs will not be able to replenish their food supply and to create the embryos that are next year's flowers. Mow down crocus foliage while it's still green and the plants will not produce new corms to take the place of the old ones. Most leaves are unable to repair themselves if they are damaged. Removing a large share of the leaves of any flowering plant—annual, biennial, perennial, or bulbous—forces it to use its energy to produce new leaves at the expense of producing blooms. Keep pruning a plant's leaves and eventually the plant will die.

When a seed sprouts, the first leaves to appear are the *cotyledons*, or *seed leaves*. They are followed by

FIRST-STRING FOLIAGE

Flowers don't need a public relations department, but leaves do, at least among new gardeners. Flowers, remember, bloom for only a few days or weeks, while leaves are present throughout the garden season. Most plants have unassuming foliage, but some have leaves that are highly ornamental. Variegated foliage typically combines green with white, silver, or gold.

Artemisias (*Artemisia* spp.); silver, white

Beardtongue (*Penstemon digitalis*) 'Husker Red'; red

Caladiums (*Caladium* cvs.); white, red, pink, variegated

Canna (*Canna* × *generalis*); maroon, yellow, variegated

Coleus (*Solenostemon scutellarioides*); yellow, red, purple, variegated

Coral bells/heucheras (*Heuchera* cvs.); purple, red, variegated

Hostas (*Hosta* cvs.); gold, blue-green, variegated

Lamb's ear (*Stachys byzantina*); white

Lilyturfs (*Liriope* cvs.); variegated

Lungworts (*Pulmonaria* spp.); variegated

Sedums/stonecrops (*Sedum* spp.); 'Vera Jameson', red; 'Matrona', pink/russet; 'Purple Emperor', purple

Snow-on-the-mountain (*Euphorbia marginata*); variegated

Spotted deadnettle (*Lamium maculatum* cvs.); variegated

Variegated obedient plant (*Physostegia virginiana* 'Variegata'); variegated

Variegated Solomon's seal (*Polygonatum odoratum* var. *thunbergii* 'Variegatum'); variegated

Variegated sweet iris (*Iris pallida* 'Variegata'); variegated



Foliage as Flowers. Some plants, such as this caladium, are grown primarily for their ornamental leaves rather than their blooms. Caladiums are warm-climate plants but can be grown in containers in northern gardens.

the plant's *true leaves*, which may look different from the seed leaves. Mature foliage consists of the leaf itself, or *leaf blade*, and the *petiole*, the stalk by which the leaf is attached to the plant. (In some plants, the leaf has no petiole and is attached directly to the stem.) If there is just a single leaf blade growing from the petiole, as with coral bells (*Heuchera* spp.) or hostas, it is a *simple leaf*. A *compound leaf* consists of several leaflets growing from one petiole; astilbes and marigolds have compound leaves.

Botanists use scores of terms to describe leaf shapes, leaf divisions, leaf bases, leaf tips, and more. An ovate leaf is egg-shaped; deltoid is the formal word for a triangular leaf. A leaf with an entire margin has edges that are smooth—no teeth, lobes, or other interruptions; a leaf with toothed edges has dentate margins. *The American Horticultural Society A–Z Encyclopedia of Garden Plants* (1996) and other general garden encyclopedias (see Appendix, page 457, for more titles) provide extensive lists of plant terminology, all the words used to describe plant, leaf, and flower shapes and arrangements.

Knowing the language of horticulture—the difference between a single and double flower, for example—helps gardeners read catalogs and books more intelligently, but not knowing every technical term won't keep anyone from growing healthy plants. Once bitten by the garden bug, however, learning more about the details is inescapable.

As for leaves, what gardeners do need to know from the start is that they come in an amazing pomp of colors, textures, shapes, and sizes. In some flowering plants, such as caladiums (*Caladium* cvs.), coleus (*Solenostemon scutellarioides*), and hosta, the leaves are the main attraction, far more ornamental than the flowers. Tropical plants especially are blessed with eye-catching leaves, but even run-of-the-mill foliage is a garden asset.

Parsing Flowers

As vital as roots, stems, and leaves are, blooms get center stage in the garden. Botany texts describe flowers as “modified or specialized shoots,” but they are far more to gardeners: They are the plant's glory. The German poet Goethe called them “the beautiful hieroglyphics of nature by which she indicates how much she loves us.” Flowers may do all this, but they are also utilitarian, a plant's *raison d'être*, the main stop on its route to immortality. Reproduction occurs in flowers. The fact that they enchant us with a raft of colors and forms and textures and fragrances is icing on the cake.

Botanists have generated a mountain of technical flower lingo, beginning with *inflorescence*, which is the formal term for the flowering part of a plant. There are big and little flowers, and dozens of bloom forms: trumpets, funnels, tubes, bells, wheels, pompons, cups, and many more. In some species, a flower

HEADS UP

Capitulum, which means “little head,” is the formal term for flower heads that are more than they appear. Daisies and other aster family plants produce *capitula*; their flowers look like single blossoms but actually consist of many flowers. So a daisy isn’t just a flower, it’s a bouquet, a cluster of tiny disc flowers, the daisy’s eye, surrounded by ray flowers, the so-called petals we pluck when we want to know if he or she loves us. In this case, the tiny flowers that make up the head, or capitulum, are usually referred to as *florets* rather than flowers.

is a flower is a flower, a single bloom on a stalk, like a tulip’s. Other species, like sweet woodruff (*Galium odoratum*), are more complicated and bear flowers in combinations and different arrangements.

Baby’s breath (*Gypsophila paniculata*) has a *panicle* arrangement: many flowers on a many-branched stem. *Umbel* flowers, such as the ornamental onion star of Persia (*Allium christophii*) resemble umbrellas, with each flower stalk originating from a single axis. The blooms of common foxglove (*Digitalis purpurea*), gladioli, and other species with a *spike* arrangement are attached directly to upright stems. Plants with a *raceme* arrangement, such as hollyhock (*Alcea rosea*), have a single upright stem with flowers attached by individual stalks, or *pedicels*.

Whatever their color, size, shape, or arrangement, most flowers have four parts: sepals, petals, stamen, and pistil. (Flowers with all four parts are *complete*; those missing one or more parts are *incomplete*.) At the base of a bloom are the *sepals* (pronounced “SEA-pulls”), the green leaflike wrappers that protect the flower bud. Collectively the sepals are known as the *calyx*, Greek for “covering.” When the bud is ready to open, the sepals fold back to allow the petals to unfurl.

White or brilliantly hued, plain or marked, aromatic or scentless, the *petals* are the most conspicuous part of nearly all flowers. Collectively known as the *corolla*, petals are a flower’s cleavage, its come-hither means of attracting bees and other pollinators—and gardeners. In addition to a gallery of colors and stripes, spots, and streaks, petals can be *single*, as they are in most cosmos, or *doubled*, as they are in the old-fashioned *Paeonia officinalis*

‘*Rubra Plena*’. They can be *reflexed*, meaning pointing backward, as they are in cyclamens (*Cyclamen* spp.), or recurved, fused, semidoubled, and more. In *The Mikado*, Nanki-Poo and Ko-Ko are celebrating petals when they sing of the “flowers that bloom in the spring, tra la.”

The forms, colors, markings, and fragrances of flower petals in the wild are not random but intentional, botanical examples of good marketing. Like contemporary ads targeted at a specific audience, petals have evolved to entice exactly the right pollinators. Hummingbirds, for example, are bewitched by the color red, so plants like bee balms (*Monarda* spp.) and torch lilies (*Kniphofia* spp.) with shapes that require long beaks to reach the nectar—the hummingbird’s payoff for carrying the pollen from one bloom to another—tend to be red.

In the Public Broadcasting System’s television series *The Private Life of Plants*, host David Attenborough showed viewers what an insect sees. Under ultraviolet light—which replicates an insect’s perception—a yellow evening primrose (*Oenothera macrocarpa*) has markings that point pollinators to its nectar and pollen. Foxgloves (*Digitalis* spp.) and



Spider Flower. Most *Cleome hassleriana* cultivars are large, erect plants with scented blossoms in hues of white, pink, and pale purple. Cleomes, old-time favorites, often self-seed, reappearing year after year, despite being annuals.

EXCEPTIONS TO THE RULE

In some flowers, including begonias, lilies, irises, and tulips, the sepals and petals are indistinguishable and are referred to as *tepals*. Anemones, or windflowers (*Anemone* spp.), are among the flowers that don't have sepals. The green leaflike parts at the base of the flowers in some species aren't sepals but modified leaves called *bracts*. A few flowers—poinsettia (*Euphorbia pulcherrima*) and calla lilies (*Zantedeschia* cvs.) are examples—have what appear to be petals but are actually bracts that surround a tight cluster of true flowers.

pansies have similar roadmaps, but theirs are visible to human eyes. Similarly, the colorful “eyes” of many daylily cultivars serve as targets at which pollinators can aim (while also being a joy to gardeners).

Sepals and petals are sterile—essential in attracting pollinators but not directly involved in producing seeds. That process belongs to what biologists call a flower's *essential organs*, its stamen and pistil. The *stamen* is the male part of the flower and contains the pollen-making anthers. (The prim and proper Mrs. William Starr Dana, writing a children's botany

book in 1896, called the anthers “dust boxes.” When you see flowers, she wrote, “I hope that you children . . . will try to carry away in your minds a clear idea of the size and shape of their dust boxes.”) The *pistil*, which contains a *stigma* and a *style*, is the female part of the flower.

Flowers are either *perfect*—containing both male and female parts—or *imperfect*, containing either male or female parts but not both. Most garden flowers, such as petunias, snapdragon (*Antirrhinum majus*), and lilies, are perfect. Imperfect flowers are either *monoecious* (separate male and female flowers are produced on the same plant) or *dioecious* (a plant produces either male or female flowers). Begonias and castor bean (*Ricinus communis*) are examples of monoecious flowers. Goat's beard (*Aruncus dioicus*) bears dioecious flowers, so if you want flowers *and* seeds from goat's beard, you need to have both female and male plants in your garden.

Sex and Reproduction in the Garden

Flowering plants reproduce by asexual and sexual methods. Many species do both. *Asexual*, or *vegetative reproduction*—the creation of progeny from a single parent—is rare in the animal kingdom but is common among plants. Species with a G rating include those that reproduce from above- and underground stems, as iris and lily-of-the-valley (*Convallaria majalis*) do and flowers like lilies and crocuses, which form new bulbs or corms. Other plants propagate by sending up new stems from their roots, and some plants multiply through *fragmentation*, wherein a piece of a plant breaks off, falls to the ground, roots, and grows. Asexual reproduction guarantees another generation because the plant doesn't require outside help.

Gardeners and commercial growers propagate herbaceous plants vegetatively by rooting cuttings, dividing clumps, and tissue culturing, or micropropagating. (For more information on propagating plants, see “Spreading the Joy,” page 139.) Asexual reproduction assures conformity. New plants will be identical to their parent: They will have exactly the same traits, good or bad, everything from flower color to the ability to resist or not resist diseases. Vegetative propagation is far faster than growing plants from



Plant to Pollinator. The reproductive parts of this ‘Sigudilla’ daylily are displayed prominently, their placement and the bloom’s yellow eye carefully designed to facilitate pollination by bees, insects, and other beneficial wildlife.



Garden Helpers. Many flowers, including these asters, depend on butterflies and other wildlife to produce seeds, which is one of many reasons why using toxic chemicals in the garden is not in the home gardener's best interest.

seeds, but what it lacks is genetic variation. With asexual reproduction, there are no new colors or forms or adaptations to insects and weather.

In contrast, *sexual reproduction*, the union of female and male reproductive cells, ensures genetic variation. Many offspring will be similar to their parents and to one another but not necessarily identical, and some may be altogether different. Sexual reproduction is not only how most plants multiply, but it is the way that they improve their chances of survival, adapting over generations to their environment—to cold or heat, for example—or becoming more alluring to pollinators. Plant breeders depend on sexual reproduction to create different and better—and some not-so-different and not-so-better—flowers for our gardens.

Pollination—the transfer of pollen from the anthers to the stigma—comes about in two ways: *self-pollination* within a single flower or from one flower to another flower on the same plant or *cross-pollination* between the flower of one plant to the flower of another plant. Self-pollinating flowers tend to have fewer and smaller blooms and be monocolored and unscented; their descendents have less genetic variability than those of cross-pollinating flowers. Cross-pollinating species usually have many and larger flowers that are brightly colored, marked, and scented. Because of the genetic variety of cross-pollination, these plants tend to be stronger and more successful. Not surprisingly, evolution has produced more cross- than self-pollinating plants.

Cross-pollinating species have an Achilles' heel, however. Flowers can't move about and find mates as animals do. They need help getting the pollen from the anthers to the stigma. Or, as Mrs. William Starr Dana modestly explained in *Plants and Their Children* (1896), they need help getting "the wonderful golden dust that turns flowers into apples as easily as Cinderella's fairy godmother turned rats into ponies" into the "seedbox."

Wind is one of two prime helpers, as hay fever victims know; the other is wildlife. Since wind-pollinated flowers don't require cooperation from the animal kingdom, they tend to be less showy but produce huge amounts of nonsticky pollen to compensate for their inefficient technique. Species that need aid from wildlife—the majority of all flowering plants—typically have flowers that are nectar-bearing as well as brightly colored, patterned, or fragrant. Insects and other animals in their search for food move pollen from one flower to another. (Research suggests that a single bee may visit as many as 50,000 flowers during its lifetime.)

Some flowers, such as goldenrods (*Solidago* spp.), attract a mix of pollinators, but most species are selective. The *coevolution* of plants and animals—plants have adapted to attract particular animals, and animals have learned that particular plants are a good source of food—has created partnerships that guarantee that pollination takes place. Different colors attract different pollinators; other pollinators depend on scent. Most animals like the same fragrances that gardeners like, but even flowers with off odors have their devotees. Our native skunk cabbage (*Symplocarpus foetidus*) is Chanel No. 5 to flies. Flowers that need perching rather than hovering wildlife have evolved with landing platforms. The "mouth" of the common snapdragon (*Antirrhinum majus*), for example, is designed to open when a pollinator of the correct weight—a bumblebee—lands on its lower lip.

Whether accomplished alone or with assistance, pollination's objective is a fruit containing viable seeds that will disperse, germinate, and thrive. New Englander Celia Thaxter, writing in 1894, called seeds more amazing than genies in bottles: "In this tiny casket lie folded roots, stalks, leaves, buds, flowers, seed-vessels . . . all that goes to make up a plant which is as gigantic in proportion to the bounds that confine it as the oak is to the acorn." How seeds are distributed is a subject unto itself, with wind, water, and animals the primary carriers. Gardeners are also major seed emissaries.

Fooling with Mother Nature

Gardeners are not only seed emissaries; they, along with botanists and commercial breeders, are botanical tricksters, changing wild plants for their own needs. As a result, a majority of the herbaceous flowers grown in North American gardens are cultivated varieties, plants altered by humans through selection or more sophisticated breeding methods. *Artificial selection*—people saving and replanting the seeds of the strongest or tallest plant, or the seeds from the plant with the largest or the bluest



Prize Winner. The daisy *Rudbeckia hirta* 'Indian Summer' is a 1995 All-America Selections winner. Plants must be widely adaptable to win an award, capable of thriving in home gardens throughout most of North America and performing as well as or better than cultivars already in commerce.

AND THE WINNER IS . . .

Some gardeners made giddy by seed racks and catalogs jam-packed with choices—for example, the 2005 Burpee catalog offers three dozen different marigolds—may want to look for the red, white, and blue shield that indicates the cultivar is an All-America Selections (AAS) winner. AAS winners, flowers, bedding plants, and vegetables, have been grown in more than 50 trial plots located throughout North America, compared with similar cultivars, and judged outstanding by independent experts. There have been nearly 350 flower winners since the first awards were made in 1933. Cultivars come and go like lightning in the seed trade, but many older winners remain available, including cleome ‘Pink Queen’ (1942), hollyhock ‘Indian Summer’ (1949), marigold ‘Naughty Marietta’ (1947), and nasturtium ‘Golden Gleam’ (1935).

flowers—has been going on for at least 10,000 years. It is the oldest and simplest way to modify plants.

But it is not the only way. The Assyrians and Babylonians were hand-pollinating date palms in the 8th century B.C. In the 1500s, Dutch growers transformed the tiny wild *Hyacinthus orientalis* into the sturdy, fragrant Dutch hyacinth we cultivate today. The London nurseryman Thomas Fairchild produced the first documented artificial hybrid in 1691. Called “Fairchild’s mule,” the flower’s father was a sweet William, its mother a carnation. In 1866 Gregor Mendel laid out the mathematics of genetics in *Experiments in Plant Hybridization*. Things got seriously complicated in the 20th century: pure-line theory, dominant alleles, chromosome inversion, trisomics, monoplids, diploids, polyploids, backcrosses, F₁ hybrids, interspecific crosses, and much more.

Artificial selection and breeding technology have refashioned some flowers so drastically that our Victorian ancestors wouldn’t know them. No 19th-century gardener would recognize ‘Teddy Bear’ as *Helianthus annuus*. It is a 2-foot plant topped by a shaggy, doubled, petalless flower that has none of a classic sunflower’s appeal. We can buy pansies without faces, snapdragons (*Antirrhinum majus*) with no snap, and sweet peas (*Lathyrus odoratus*) that aren’t sweet. New and different are not always better.

Flower breeders have been intent on creating new colors and shapes, decreasing or increasing plant size, changing plant form, lengthening bloom time, and improving resistance to diseases and insects and tolerance to heat and cold. The benefits are undeniable: daylilies like ‘Stella de Oro’, with flowers that stay open for more than a day; ‘Profusion Cherry’, an award-winning zinnia that is mildew-tolerant and heat- and drought-resistant; and ‘Feather Daisy’, a compact, semidouble Shasta daisy (*Leucanthemum × superbum*) that doesn’t require staking.

Increasingly, our gardens are filled with *hybrids* rather than open-pollinates. *Open-pollinated cultivars*, or OPs, are plants that pollinate on their own and bear seeds that produce offspring pretty much like themselves. Hybrids are artificial crosses—occasionally accidental crosses—between different plants of the same species, between different species, or between plants from different genera.

Hybrids should be identified by a multiplication sign in their name—such as *Leucanthemum × superbum*, the Shasta daisy’s formal moniker—but nurseries, seed companies, and garden writers often omit it. In truth, the details of the crossing and recrossing and reverse crossing are so convoluted that the names of grandparents and parents often are lost, or concealed, by breeders. As a result, many hybrid cultivars are listed only by their genus and cultivar name. *Lilium* ‘Genteel Lady’, for example, is a fragrant Oriental hybrid lily with white, bowl-shaped flowers marked by lavender-pink spots. Despite being both genteel and a lady, neither we nor she has any idea who was her father.

Creating a hybrid demands a knowledge of genetics, tedious hand-pollinating, and careful record keeping, and it can take a decade or more to fashion a cultivar with the desired combination of traits. The *crème de la crème* of hybrids is the F₁ hybrid, the result of crossing two inbred, or stable, plant lines in meticulously controlled conditions, using one as the male parent and the other as the female parent. F₁ hybrids are highly uniform and have what is called “hybrid vigor,” the potential to grow faster or bigger or better, or have superior adaptability to different conditions, such as heat or cold.

The down side? In addition to a much higher price tag for a packet of seeds or a nursery-grown plant, gardeners can’t save seeds from hybrids for next year’s garden. Actually they can, but they will be



Old-Timer. The origins of the ubiquitous *Hemerocallis fulva* are lost in time. Known as the common daylily, the tawny daylily, and the ditch lily, it was an early European immigrant to North America. Although it spreads vigorously, it rarely produces seeds.

disappointed by the results. Seeds from hybrid plants do not *come true*: They do not yield uniform seedlings with all the characteristics of their two parents. Some hybrids, such as the popular marigold triploid hybrids, which are crosses between tall African marigolds and compact French marigolds, rarely produce *any* seeds. Those they do bear often don't germinate, and those that germinate don't come true.

While many gardeners believe that the advantages of hybrids outweigh any of their disadvantages, the unstinting emphasis by commercial breeders on

hybrid cultivars has hatched an interest in old and OP cultivars. The champion of this movement—and a recipient of the MacArthur Foundation Genius Award—is Kent Whealy and his colleagues at Seed Savers Exchange. Whealy has focused on vegetables and fruits, while his wife, Diane, has established the Flower and Herb Exchange, an effort to preserve older, or *heirloom*, garden flowers, wildflowers, and herbs. Scott Kunst at Old House Gardens in Michigan has done similar work in behalf of bulbous flowers. (See Appendix, page 457, for more information.)

HEIRLOOM BEAUTIES

If you want to grow flowers that your grandmother grew (or even her great-great grandmother grew), there are plenty of older cultivars still available thanks to horticultural preservationists. These heirloom plants, named varieties that are at least 50 years old, deserve a place in today's gardens. New is not always better, as this sample of old-timers proves.

Astilbes (*Astilbe arendsii*) 'Bridal Veil', 1929;
A. japonica 'Gladstone', before 1934

Bearded irises (*Iris* Bearded Hybrids) 'Honorabile',
1840; 'Wabash', 1937; 'Great Lakes', 1942;
'Amigo', 1943; 'Ola Kala', 1948

Bachelor's button (*Centaurea cyanus*) 'Jubilee Gem',
before 1937

Bee balm (*Monarda didyma*) 'Cambridge Scarlet',
before 1908

Cosmos (*Cosmos bipinnatus*) *C. sulphureus* 'Sunset',
circa 1895; 'Sensation', 1936

Crocuses (*Crocus chrysanthus*) *C. × luteus* 'Dutch
Yellow'/'Yellow Mammoth', 1665; 'Snowbunting',
1914

Crown imperial (*Fritillaria imperialis*) 'Lutea', 1665

Daffodils (*Narcissus* cvs.) 'King Alfred', 1899;
'Mrs. R. O. Blackhouse', 1921

Dahlias (*Dahlia* cvs.) 'Kaiser Wilhelm', 1892; 'Jersey
Beauty', 1923; 'Bishop of Llandaff', 1927

Daylilies (*Hemerocallis* cvs.) 'Hyperion', 1924;
'Thelma Perry', 1925

Everlasting pea (*Lathyrus latifolius*) 'Pink Beauty',
before 1924

Fairies' toadflax (*Linaria maroccana*) 'Fairy Bouquet',
1872

Fall-blooming, or Japanese, anemone (*Anemone ×
hybrida*) 'Honorine Jobert', 1851

Feverfew (*Tanacetum parthenium*) 'Flore Pleno',
before 1700

Flowering tobacco (*Nicotiana glauca*) 'Lime Green',
before 1950

Garden phlox (*Phlox paniculata*) 'Tapis Blanc', 1901;
'Bridesmaid', 1910; 'Rijnstroom', 1910; 'Bright
Eyes', 1934

Gladioli (*Gladiolus* cvs.) 'Carolina Primrose', 1908;
'Atom', 1946; 'Spick & Span', 1946

Hollyhock (*Alcea rosea*) 'Indian Spring', before
1930

Hyacinth (*Hyacinth orientalis*) 'Marie', 1860; 'Lady
Derby', 1875; 'Distinction', 1880

Japanese iris (*Iris ensata*) 'Goldbound', 1885

Lilies (*Lilium* cvs.) *L. lancifolium* 'Splendens' 1804;
L. speciosum 'Rubrum', 1830; 'Mrs. R. O.
Blackhouse', 1921; 'Fire King', 1933

Lupines (*Lupinus* cvs.) 'Russell Hybrids', 1937

Marigold (*Tagetes patula*) 'Naughty Marietta',
1947

Mexican sunflower (*Tithonia rotundifolia*) 'Red
Torch', 1951

Morning glory (*Ipomoea nil*) 'Scarlet O'Hara',
circa 1939

Nasturtium (*Tropaeolum majus*) 'Empress of India',
1884

New England aster (*Aster novae-angliae*) 'Mrs. S. T.
Wright', before 1907

Oriental poppy (*Papaver orientale*) 'Princess Victoria
Louise', by 1930

Peonies (*Paeonia* cvs.) 'Francis Ortegat', 1850;
'Festiva Maxima', 1851; 'Duchesse de Nemours',
1856; 'Sarah Bernhardt', 1906

Pot marigold (*Calendula officinalis*) 'Orange King',
before 1850

Sedum/stonecrop (*Sedum*) 'Autumn Joy', before
1920

Snapdragon (*Antirrhinum majus*) 'Sawyer's Mixed',
before 1600

Sneezewort (*Achillea ptarmica*) 'The Pearl',
circa 1850

Sweet pea (*Lathyrus odoratus*) 'Cupani', 1699;
'Painted Lady', 1737; 'Mrs. Willmont', 1901;
'Lord Nelson', 1907

Tawny daylily (*Hemerocallis fulva*) 'Europa', 1700s

Tulips (*Tulipa* cvs.) 'Prince of Austria', 1860;
'Rosamunde Huykman', 1895; 'Generaal de
Wet', 1904; 'Lac Van Rijn', 1620; 'Fantasy', 1910;
'Zomerschoon', 1620