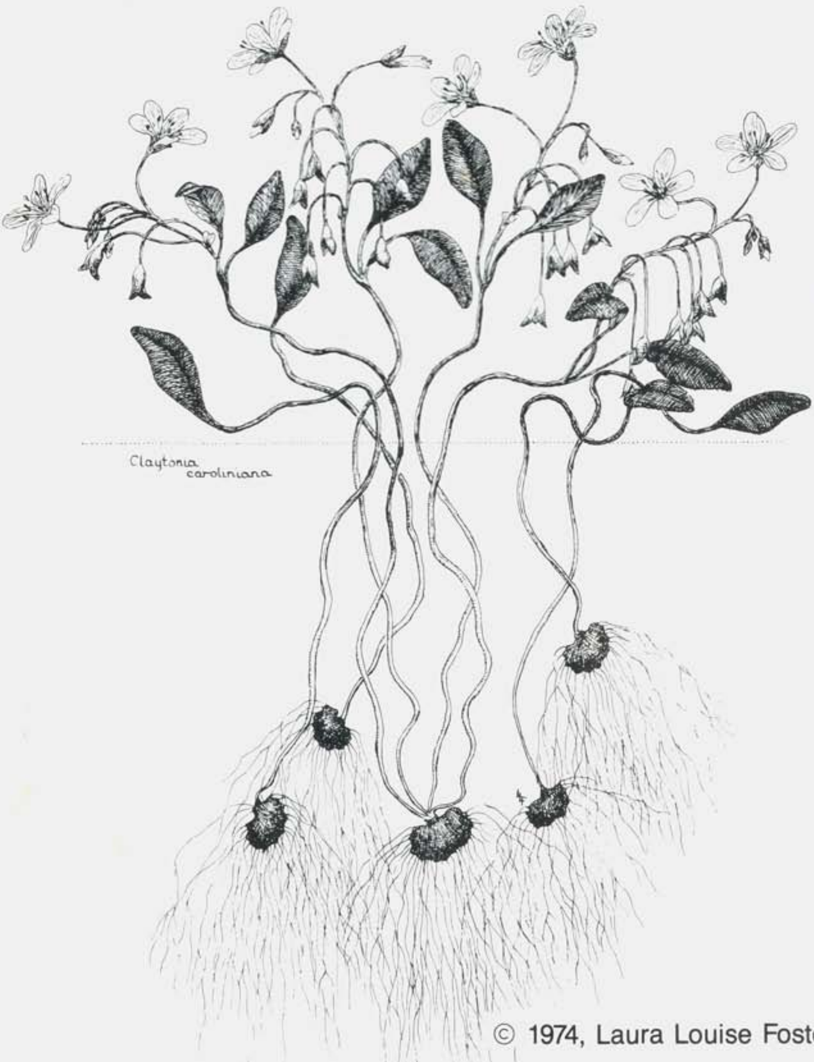
Bulletin of the

American Rock Garden Society



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BULLETIN OF THE AMERICAN ROCK GARDEN SOCIETY

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CALENDAR OF COMING EVENTS

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Eastern Winter Study Weekend
(Allegheny Chapter) .... January 1989
Western Winter Study Weekend—Vancouver
(Alpine Garden Club of British Columbia) .... February 1989
Annual Meeting—Wilmington, Delaware (Delaware Valley Chapter). . .1989

Cover Picture: *Claytonia caroliniana* by Laura Louise Foster, in memorium. (Page 72)

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Bulletin of the American Rock Garden Society

Plant Hardiness
Or Do Your Plants Really Enjoy Your Garden?

Jim Borland
Denver, Colorado

The First Plant Hardiness Map

If the tree of knowledge existed only in the Garden of Eden and it bore fruit so inviting that they were forbidden to the garden's inhabitants, it shouldn't be too difficult to believe that either Adam or Eve took a few seeds of that fruit with them upon their expulsion.

Imagining further that these seeds were later planted, the first nursery was begun with, undoubtedly, at least some concern regarding not only the successful germination and growth of these seeds, but also the resultant flowering and production of fruit at an alien site.

Either success or failure of that first venture in horticulture would have given man the first bits of information necessary to compile a plant hardiness zone map.

This simple but effective method continues to be the ultimate test of a plant's hardiness even today with our sophisticated and technical knowledge of plant "ologies": physiology, ecology, edaphology, pathology, etc.

Current Plant Hardiness Maps

Since this hypothetical first horticultural trial, man has continued spreading the world's vegetative wealth into regions and climates often vastly different from the original.

Too often the only criterion used to determine the potential success or failure of that venture is the average low winter temperature experienced at the proposed site. Although proven success at surviving some specific low temperature has resulted in a species being accorded a hardiness rating, the *New York Botanic Garden Illustrated Encyclopedia of Horticulture* reminds us, as do several other texts, that other factors should be considered in this rating as well.

The *Encyclopedia* states that *hardy* and *hardiness* "refer to the ability to survive under the total year-round climate conditions of a designated region or place" and that these terms only "allude to the capability of persisting through the winter and this of course is closely related to minimum temperatures."

Ignoring the more general definition and following the last allusion only, a number of prestigious organizations (e.g. The Arnold Arboretum and the United States Department of Agriculture) have in the past attempted to give us a guide to plant hardiness by dividing the country into zones of average low winter temperatures. Although helpful, these maps have proven little value to those of us who constantly tempt horticultural fate through the sheer madness of believing that plants native to the 20,000–foot level in the Himalaya should grow and flourish in the hardwood forests on the outskirts of muggy Philadelphia or deep inside the xeric and alkaline, urban confines of Denver.

Mistakenly, some believe that the greatest limitation of maps of this type is the fact that they were derived from weather records which, in many cases were, and still are, faulty in their representation of specific regions.

Weather records for Vermont, Maryland, and Delaware, for example, have been derived from information fed by only one official recording station from each state, even though gardeners from these areas will quickly substantiate the vast differences in climate to be found in each. The records for inland states can be as misleading when one considers that Utah, harboring large regions which are high, cold desert, montane, alpine and warm desert, for a long time had only one weather station as well.

Although we will all have to wait for the new plant hardiness map currently being generated by the National Arboretum, they have already stated that it too will be based upon average low winter temperatures. And even though it is planned to be 1) more detailed than previous maps, 2) have different zone codings, and 3) contain "dot" maps of at least 100 indicator plants, it undoubtedly will not address other growing conditions which determine hardiness.

Factors other than those which determine the life or death of a plant must also be considered. Year-round performance is as important to most gardeners as is the plant's ability to survive winter. For example, plant hardiness maps do not address high summer temperatures which can affect not only the temperature of the air but also that of the soil. Although information regarding plant performance during these periods is better documented for agronomic crops, trends can be recognized which may give us clues to the poor performance of ornamentals as well.

Summer temperatures too high for the successful economic performance of lettuce and several members of the mustard family are well known even to the backyard gardener. Less known or encountered are the few days each summer when many areas of the country experience temperatures high enough to cause either the failure to set or the abortion of flowers or developing fruits of tomatoes.

Encountered even less, but equally important, are the cool nighttime temperatures, experienced primarily in the West, which can also result in the failures of certain vegetable fruits to set.

Zone maps are of limited value when trying to determine if the total performance of other woody members of the food set will live up to expectations. For example, it is now expected along the northern front range of the Rockies that although cultivated members of the *Prunus* genus will flourish vegetatively, successful fruit crops can be expected only once every 4 to 5 years due to flower damaging late spring frosts.

In a reversal of the common use of zone maps, we find that they give us absolutely no information regarding the performance of the majority of perennial temperate-zone blooming plants which require a minimum vernalization period before they will bloom. How far south can one successfully bloom members of the*Tulipa* genus or expect fruit from apple trees? Both vegetatively grow well south but are infrequently seen due to the lack of total growing period performance.

Hardiness zone maps also fail to inform us of factors related to sunshine intensity. Gardeners transplanted to the West immediately recognize the importance of this factor when their first attempt at growing impatiens and begonias in full sunlight as they did back east results, at best, in dwarfed and scorched specimens only slightly resembling their former attempts. Although the newer varieties perform better under these conditions, the major seed companies have never publicly acknowledged this potential problem.

Horticulturists in the western United States have railed for decades now at the general national ignorance of another growth factor, soil pH, which limits the hardiness of as many plant species as low winter temperatures. The relatively high pH inherent to most low elevation western soils dramatically affects the availability of specific plant nutrients, producing abundance or toxicities of some and deficits of others. Although the grower of small plants can usually overcome the problems associated with this phenomenon, it is particularly impossible for those who are intent on growing larger specimens whose extensive root systems soon outgrow the site of any minor soil amendment that might have been incorporated when planting.

Hardiness maps based on minimum winter temperatures also assume that the grower is able to provide any supplemental water which may be necessary to sustain plant life. As many horticulturists west of the Mississippi are aware, this assumption is no longer care or cost free. Limited water supplies and associated increased costs are beginning to become a way of life for many communities.

Choosing plants hardy enough to exist on the mean annual precipitation for any area is now becoming increasingly important. Additionally, complicating this selection is the knowledge necessary to account for not only the annual amounts received, but also the amounts which fall during the growing season and the capability of the soil to absorb it rather than uselessly allowing it to flow away.

Zone maps also do not tell us that vast areas of the West experience water evaporation rates in excess of five to ten times that which annually falls from the sky. Without specialized plant morphological or physiological features, common to many of the West's plants but totally unrelated to surviving winter's low temperatures, few commercially available plants would prove truly hardy.

These and other ecological factors act not separately, as plant hardiness maps might indicate, but in concert in deciding a plant's hardiness.

An example of one of these extreme interactions which might interest growers of alpine plants was demonstrated by a study undertaken in the Pir Panjal Range on the Asian continent. Here researchers found that although the air temperature taken in the shade of some plants read 46°F, that of a thermometer placed in sunshine read 132°F, or a difference of 86°F! What this extreme variation in temperatures experienced by these alpine plants means in terms of their ability to survive, or be hardy, when planted in lower elevations around the world is unknown.

Examples such as these usually emphasize the importance of air temperature on plant growth, neglecting entirely the temperature of the soil. It is only now becoming clear, again with studies of agronomic plants, that different parts and physiological processes of a plant respond differently to simi!ar temperatures.

In one study of tomatoes, it was determined that at nighttime temperatures which stopped the growth of stems, the root system was still actively growing and expanding.

In another study linking the optimum air temperature with the optimum sunlight levels for growth, it was found that the general optimum air temperature for alpine and arctic plants to most efficiently utilize sunlight was approximately 50°F and that for tropical crops was 77°F. How many of us are attempting to grow plants from the high elevations or latitudes in gardens where optimum temperatures are found at best during only a short time in spring and fall? If these plants are found to grow but not thrive in award winning manner, are they hardy? Is any of this related to winter low temperatures?

Thwarting the seeming simplicity of even these bare examples is another study which found that for one species, *Oxyria dignya,* found in both regions of high elevations and high latitude, plants from Colorado had much lower photosynthetic rates than those of the Yukon, under the same sunlight levels. Yet the Yukon plants were capable of utilizing much higher levels of sunlight than those from Colorado. However, yet another study found that arctic plants in general have lower photosynthetic rates than temperate plants. This lower daytime photosynthetic rate may indicate another physiological factor tied to the difficulty of growing arctic or alpine plants at lower elevations.

Respiration, a physiological process which releases energy from the food stored during the daytime photosynthetic processes, is driven mainly by temperature. During the day it acts along with photosynthesis, a process which usually makes more food than can be released, but at night it is driven almost solely by the air temperature.

Under conditions of cold alpine or arctic nights, respiration is in a life balance with the daytime processes, but in lower elevation gardens, where nighttime temperatures are only a few degrees lower than daytime temperatures, respiration can potentially "eat itself alive" by converting all its daytime produced reserves into energy.

The energy received from sunlight, both visible and invisible, differs in several other significant aspects which can dramatically affect plant growth and, ultimately, hardiness.

Although a discussion of these factors can easily become complex and technical to describe in detail, anyone who has traveled even very little can attest to the climatic variances experienced. Differences in degrees of cloudiness, days of sunshine, intensity of sunshine and coolness of nights are common as one travels from coastal to more continental regions. Adaptations to these variances are often so strong that plants frequently cannot easily adapt to other sunlight regimes. Again, one has to ask if any of this is related to mean low winter temperatures.

Photoperiodism and Cold Hardiness

One factor of sunlight not yet discussed but closely related to plant cold hardiness is photoperiodism, or the response of plants to the relative duration of day and night.

As we know, the length of the day, and correspondingly that of the night, changes throughout the year, especially in the high northern and southern latitudes. The Arctic Circle at 66° north latitude is the geographical boundary north of which the length of the day and night can vary as much as 24 hours, while at 40° north latitude (Denver and Philadelphia) they can vary only as much as 6 hours.

It is now fairly common knowledge that it is the length of their night, not the day, that affects the blooming cycle of *Euphorbia pulcherrima, Chrysanthemum* x *morifolium* and *Zygocactus* species and others, but it is not commonly recognized that this photoperiod is also responsible for a myriad of other plant processes such as fruit and seed maturation, vegetative growth, bulb and tuber formation, branching, leaf abscission, leaf shape and dormancy preparation.

Plant processes which respond to long days (short nights) are called "long–day" responses and those responding to short days (long nights) are called "short–day" responses. The reason that they are not referred to by terms which reflect that part of the 24–hour cycle (night) which directly affects the process in question is that when the initial investigations uncovered the linkage between cause and effect, it was believed that it was the length of the day that had the promotive effect, thus "day" terms were coined and persisted even after further investigations proved otherwise.

In truth, there exists a multitude of response groups to which plants or processes belong, including combinations. Three other important groups include "day–neutral" processes which respond neither negatively nor positively to the length of the day or night; "photo–inductive" processes which are merely induced into responding, not controlled, by the night length; and those processes which are photoperiodic but highly dependent upon temperature.

Since it is the blooming cycles that concern most, it should be interesting to note that, generally, the high latitudes are populated with long–day plants. When these are moved to lower latitudes, they often fail to flower since these latitudes never experience summer nights as short as those the plants experienced further north.

Correspondingly, lower latitude plants, which generally belong to the short–day response group, if moved to higher latitudes often continue in vegetative growth until the first killing frost. This is a result of there not being enough time between the initiation of long nights and subjection to the first green vegetation killing temperatures. At lower latitudes, fall temperatures gradually descend over a longer period than at northern latitudes, thereby giving plants plenty of preparation time before freezing temperatures are experienced.

Dramatic effects of this order of magnitude are perhaps easier to comprehend than those nearer the tropics where a difference of only 15 minutes in the length of the night can mean the difference between bloom or no bloom.

The importance of all this is probably lost on those who are interested in using only those plants which have been endlessly selected against responding so specifically to day length, as is the case with most bedding plants and, to a much lesser degree, woody landscape plants.

Foresters, on the other hand, have long recognized the need to pay particular attention to the source of seed, or provenance, when planning reforestation efforts. Besides ecotypic differences in other plant growth related factors such as differing abilities to 1) absorb nutrients, 2) exist on various soil substrates, or 3) germinate quickly is the ability to perceive the on–coming winter sufficiently far enough in advance to make necessary physical and physiological preparations.

Both the latitude and elevation of the harvested seed are noted as both these factors play a large part in the survivability of the resulting planted seedlings.

Judgments on the adaptability of this seed are based on some of the same factors rock gardeners use when planning either a photographic or seed–gathering trip. Lost opportunities in either of these ventures can sometimes be overcome by realizing that another chance may be had either north of or higher than the present location. A simple formula which may help in this endeavor states that for every 200–foot rise in elevation, the equivalency of a trip 72 miles north is represented.

Although these exact figures may not be remembered by everyone, it is common knowledge that spring comes later the further one travels either up the mountain or north in latitude. What we seem to forget is that fall comes correspondingly sooner as well.

One has to wonder how the same species can continue to thrive either higher up the mountain or further north in latitude when the growing season in both these places can be considerably shorter than the lower elevation or more southerly location. Even more critical than the spring bloom and seed maturation period is the shortened period which the parent plant has to prepare for winter conditions. The answer for most woody plants, of course, is the ability of the plants from the more northerly or higher locations to perceive the increasing length of the night and react more quickly than their more southern or lower elevation brethren.

The first stage of a woody plant's preparation for enduring winter's cold temperatures, or cold hardiness, is the perception, through the leaves, of the lengthening night. This begins many internal processes, some of which may be perceived externally as slowed growth, greater cuticle thickness, and a general loss of succulence in both leaf and stem tissues. Progressively throughout this and the next stage, the plant becomes hardier, able to withstand colder and colder temperatures without damage.

The next stage for most temperate woody plants is initiated after its subjection to frost forming temperatures. Soon after experiencing these lower temperatures, and usually after leaf fall, internal biorhythms take over and the plant soon becomes as cold hardy as it will ever be. If the plant is capable of surviving even lower winter temperatures, it will utilize one of two currently known mechanisms.

The first, titled "ice avoidance," is a mechanism whereby plant cells are able to avoid the internal formation of lethally destructive ice through a physical phenomenon known as "supercooling."

Although rarely witnessed in everyday affairs, physical scientists have known for a long time that the temperature of pure water can be lowered to –40°F without changing its physical form from liquid to solid ice. Apparently, many plants have the ability to either partially or totally avoid the formation of physically destructive ice crystals inside the cell through this process. Species whose only defense against this ice is through ice avoidance differ in the degree to which temperatures can be lowered without damage, but none can survive below –40°F.

The second mechanism, "dehydration tolerance," is a process whereby water inside the cell is physically and physiologically withdrawn and deposited *between* the cell walls where ice crystal formation is not destructive to the cells. This withdrawal of interior cell water presents a death defying dilemma as it places living tissue in potential lethal jeopardy due to dehydration, which normally, under other more favorable conditions conducive to life, would result in that tissue's death.

A species naturally* capable of defying death beyond the –40°F mark is surviving through dehydration tolerance and is usually further capable of enduring temperatures below that of liquid nitrogen (–320°F).

* The term *naturally* here does not refer to the current ability of scientists to rapidly and successfully freeze a multitude of both plant and animal tissues to temperatures several hundred degrees below O°F through cryogenic procedures.

Recent studies have revealed that the long sought reason for the existence of timberlines at high elevations is almost surely due to the inability of those exposed trees or other woody vegetation to withstand winter temperatures consistently below –40°F.

The consistency with which –40°F is experienced explains not only the variation of timberline levels on the same mountain, but also the existence of low level timberlines in Alaska (3750 feet) and the increasingly higher timberlines found as one travels south: Montana (7500 feet), Wyoming (9750 feet), Colorado (10,500 feet), and Arizona (11,250 feet).

Laboratory cold hardy determinations can now be made for any plant rather quickly through a process called "differential thermal analysis." With this technique, it has also been determined that different tissues of the same plant have different degrees of cold hardiness, with the flower buds usually exhibiting less.

Spring Deacclimation

Differential thermal analysis can also be used to determine the degree of cold hardiness lost during the spring "deacclimation" period when properly vernalized plant tissues begin to break dormancy in direct response to the rise in air temperature. As temperatures rise, resistance to interior ice nucleation is gradually lost, but can be regained with the subsequent but gradual fall in air temperature. Selections of plants whose spring flower buds are capable of rapidly reacclimating would be especially useful in regions which commonly experience rapidly fluctuating temperatures during this period.

If temperatures should fall too rapidly for reacclimation or if plant growth should have already commenced, all resistance to cold temperatures may be lost, resulting in tissue damage. This is also the explanation given for some of the cases of "winter burn" or "southwest disease" which are results of partial thawing of tissues exposed to the hottest rays of the winter sun and subsequent rehydration of tissues or thawing of cell interior ice crystals. Upon the setting of the sun, air and tissue temperatures drop rapidly, too fast for reacclimation to occur, resulting in cell damage.

Thus, it is recognized that the winter blankets of burlap, pine needles, pine boughs, straw, etc. that gardeners have for years used to prevent winter damage indeed have merit. These protective measures can prevent the direct rays of the sun from heating struck tissue and/or they can assist in keeping plant tissues cold during an ususually warm spell which has the same effect on dormant tissues.

It should be noted as well that although the same tolerance to cold temperatures may be shared by two plants of the same species which have a wide latitudinal range, each may not equally survive a winter where low temperatures never reach the lethal point.

Both acclimation and reacclimation processes are driven at rates dependent on climate conditions and internal biorhythms. Acclimation rates for plants from the southern part of the range may be slower than those of their northern cousins, leaving them susceptible to damage by cold temperatures which arrive earlier in the fall in the north.

Correspondingly, these southern cousins usually deacclimate or respond to warm spring temperatures sooner than their counterparts north, thereby making them more susceptible to late spells of damaging cold temperatures.

Probably the next important area to be researched will be determinations of the cold hardiness of roots. Results of current investigations, although not as extensive as those performed on above-ground tissues, indicate a much lesser degree of inherent hardiness. Most of the woody plant root tissues tested to date indicate a rather general cold tolerance to temperature of only 15 to 25°F.

Although this tolerance is vastly different from that for above-ground plant parts, it emphasizes the excellent insulating qualities of soil, and more importantly that of snow, which, when completely covering certain northern species, allows them to exist in winter temperature zones far north of their expected and tested range. These results also explain why northern nurserymen must cover their container-grown plants during winter and why the potted rose left out over winter on the porch failed to revive come spring.

Most of what is known regarding plant cold hardiness refers to woody plants. Mechanisms controlling the preparations for winter taken by herbaceous plants are complicated and little known. It is known, however, that they are not truly ever "dormant" and that photoperiodism and temperature play important roles.

Another factor regarding cold hardiness which is currently known and which does not make the plant selection process any easier is that cold hardiness is inherited qualitatively and not quantitatively. This means that cold hardiness is not inherited simply through a single or set of genes which can be manipulated or followed easily through the breeding process. Rather, it probably involves a number of genes closely linked to the control of many other plant physiological processes.

Conclusion

Recent technological advances have tremendously increased our knowledge of the processes involved in plant hardiness. These advances have, in part, been driven by the "need to know for economic reasons" by foresters and growers who wish to expand the current growing ranges of perennial food crops.

Throughout this process discoveries regarding the complex mysteries surrounding the winter survival of herbaceous plants will be made as well. Already work has begun on techniques which will enable commercial growers of perennial flowering plants to harvest, store and ship their uprooted crops in a more successful manner.

Although the production of yet another plant hardiness map will assist us all in determining what will or will not grow in our backyards, rock gardeners who understand that more than winter's low temperatures are responsible for a plant's hardiness, may forever have to resort to the one and only method which has proven reliable—plant, hope, wait and see.

Plant or Tissue Killing Low Temperatures

Species	Twig Killing Temperatures (°F) (unless otherwise indicated)	
Abies lasiocarpa	−40	
Acer campestre 'Compactum'	−11	
A. palmatum 'Atropurpureum'	+14	
Agrimonia pilosa	+14 (buds)	+18 (rhizomes)
	+23 (roots)	
Anaphalis margaritacea	+18 (buds)	+18 (rhizomes)
	+18 (roots)	
Andromeda polifolia	0 to −8	
Arcterica nana	0 to −6	
Arctostaphylos uva-ursi	−31	
Artemisia japonica	+10 (buds)	+10 (rhizomes)
	+10 (roots)	
Berberis julianae	−27	
Buxus sempervirens	+15 (roots)	
Callicarpa japonica	0	
Calycanthus fertilis	−27	
C. floridus	−17	
Camellia japonica	0	
Cassiope lycopodioides	0 to −13	
Cercidophyllum japonicum	−2 to −11	
Cercocarpus montanus	−40	
Chamaedaphne calyculata	−6 to −15	
Chionanthus retusus	−6	
C. virginicus	−33	
Cotoneaster adpressa v. praecox	+10 (roots)	

Cryptomeria japonica	+ 16 (roots)	
Cytisus praecox	+ 15 (roots)	
Daphne x burkwoodii	− 49	
D. cneorum	+ 20 (roots)	
D. mezereum 'Alba'	− 67 (at least)	
D. pseudo-mezereum v. *jezoensis*	− 4 (buds) + 23 (roots)	− 18 (leaves)
Enkianthus campanulatus	− 6	
Euonymous fortunei v. radicans	− 4 (buds) + 14 (roots)	− 4 (leaves)
Fothergilla gardenii	− 38	
Gaultheria miqueliana	none	
G. adenothrix	none	
Hamamelis x intermedia 'Arnold Promise'	− 11	
H. japonica	− 22	
H. japonica 'Flavo-purpurascens'	− 11	
H. mollis	− 11	
H. vernalis	− 33	
H. virginiana	− 38	
Hedera helix 'Baltica'	+ 15 (roots)	
Hydrangea petiolaris	− 4 (buds)	
Ilex crenata 'Convexa'	− 22	+ 20 (roots)
I. x meserveae 'Blue Girl'	− 27	
I. pedunculosa	− 17	
Juniperus communis	− 40	
J. scopulorum	− 49	
Kalopanax pictus	− 33	
Kerria japonica	− 27	
Ledum palustre ssp. diversipilosum	− 8 to − 13	
Leucothoe fontanesiana	+ 5 (roots)	
Lilium cordatum v. glehnii	+ 23 (buds) + 23 (roots)	+ 23 (bulb)
Loiseleuria procumbens	+ 5 to − 8	
Lysimachia vulgaris v. davurica	+ 18 (buds) + 18 (roots)	+ 18 (rhizomes)
Maianthemum dilatatum	+ 14 (buds) + 23 (roots)	+ 23 (rhizomes)
Menziesia multiflora	− 6 to − 11	
M. pentandra	0 to − 18	
Miscanthus sinensis	+ 18 (buds) + 18 (roots)	+ 18 (rhizomes)

Myrica rubra	+18	
Pachysandra terminalis	−4 (buds)	−4 (leaves)
	+18 (rhizomes)	+23 to +15 (roots)
Parapyrola (Epigaea) asiatica	−1	
Parrotia persica	−22	
Parrotiopsis jacquemontia	−17	
Petasites japonicus v. giganteus	+23 (buds)	+23 (rhizomes)
	+23 (roots)	
Picea glauca	−10 (roots)	
P. pungens	none	
Pieris floribunda	−27	+5 (roots)
P. japonica	+14 to −8, −11	+10 (roots)
Pinus bungeana	−22	
P. cembra	none	
P. densiflora	−76	
P. mugo	none	
P. nigra	−40	
P. peuce	−40	
P. pumila	none	
P. strobus	none	
Plantago asiatica	+14 (buds)	+14 (rhizomes)
	+14 (roots)	
Potentilla fruticosa	−10 (roots)	
Prunus americana	−45	+14 to +7 (flower bud)
P. besseyi	−40	+10 to −9 (flower bud)
P. cyclamina	−33	
P. japonica	−41	+12 to +5 (flower bud)
P. maacki	none	none (flower bud)
P. nigra	−49	0 to −4 (flower bud)
P. pensylvanica	none	+9 to −6 (flower bud)
P. sargentii	−38	
Pseudolarix kaempferi	−49	
Pseudotsuga menziesii	−40	
Pyracantha coccinea	+18 (roots)	
Pyrola alpina	+18 (buds)	+9 (leaves)
	+23 (rhizomes)	
P. incarnata	+1 (buds)	+5 (leaves)

	+18 (rhizomes)	
P. renifolia	+9 (buds)	+23 (leaves)
	+23 (rhizomes)	
P. secunda	+1 (buds)	+5 (leaves)
	+23 (rhizomes)	
Pyrus ussuriensis	−18	
Quercus mongolica v. grosseserrata	−4 (buds)	
Rhododendron brachycarpum	−8 to −18	
R. carolinianum	0 (roots)	
R. dauricum	−17 to −24	
R. dilatatum	+3 to −13	
R. 'Hinodegiri'	+10 (roots)	
R. japonicum	−4 to −33	
R. keiskei	+12 to +1	
R. obtusum	−2 to −20	
R. 'P.J.M.' hybrids	−10 (roots)	
R. ripense	+10 to +9	
R. tschonoskii	−4 to −11	
Ribes cereum	−40	
Rosa acicularis	−44	
R. arkansana	−36	
R. blanda	−13 to −29	
R. foetida 'Austrian Copper'	−15 to −24	
R. rubrifolia	−2 to −29	
R. rugosa	−8 to −36	
R. woodsii	−35	
Sanguisorba tenuifolia v. alba	+18 (buds)	+18 (rhizomes)
	+23 (roots)	
Sanicula chinensis	+23 (buds)	+23 (rhizomes)
	+23 (roots)	
Solidago virga-aurea	+9 (buds)	+14 (rhizomes)
	+14 (roots)	
Stewartia koreana	−27	
S. monadelpha	−27	
S. pseudocamellia	−27	
S. rostata	−11	
Styrax americanus	−22	
S. japonicus	−22	
S. obassia	−27	
Symplocus paniculata	−22	
Syringa vulgaris	none	
Taxus media 'Nigra'	+10 (roots)	

Tiarella polyphylla	+ 14 (buds) + 18 (leaves) + 14 (rhizomes) + 23 (roots)
Trifolium pratense	+ 23 (buds) + 23 (rhizomes) + 23 (roots)
Tsusiophyllum tanakae	− 4 to − 11
Ulmus pumila	− 6 to − 17
Vaccinium smallii	+ 10 to − 4
V. vitis–idaea	+ 5 to − 20
Viburnum x burkwoodii 'Chenault'	− 27
Vinca minor	+ 15 (roots)
Xanthorhiza simplicissima	− 67 (at least)
Zenobia pulverulenta	− 33

Note: For his complete list, including many more woody species, send a S.A.C.E. to Jim Borland, 320 Adams, Denver, CO 80206.

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Laura Louise Foster

January 25, 1918 to January 31, 1988

The death of Laura Louise Foster—"Timmy" to her friends—has been a sad loss to our society and the cause of deep grief to her many friends.

From 1978 to 1984 Timmy served as editor of our *Bulletin* and, despite periods of ill health, brought it to a new level of excellence in both physical appearance and quality of the writing. Her true calling, however, and area of great distinction, was as a botanical artist.

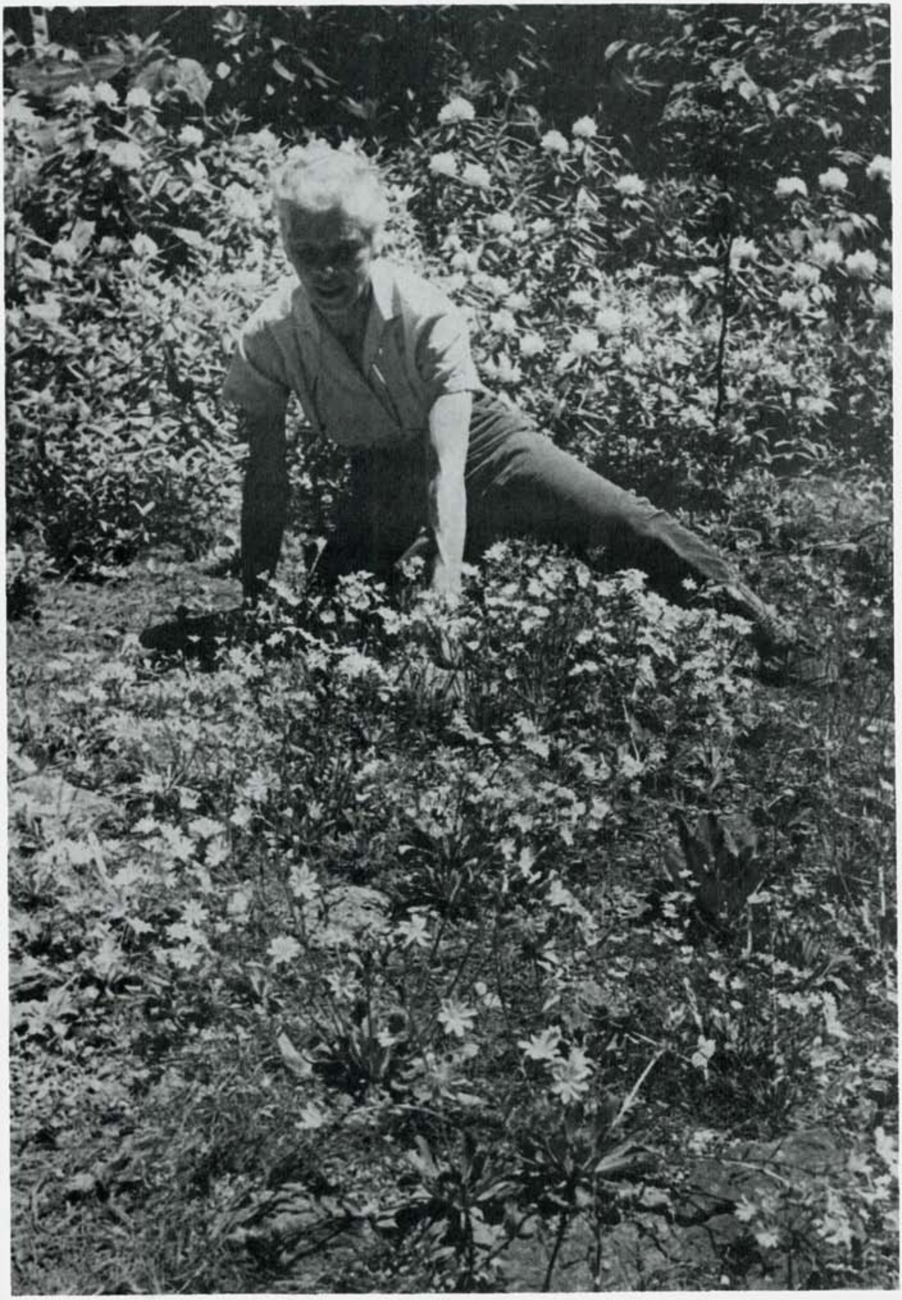
A friend once told me that everyone is either a farmer or a poet. Timmy was clearly a poet, i.e., one who captures for all time an evanescent phenomenon, not with words but with precise lines on paper. Her output was enormous. There was nothing pretentious about her art, merely perfection. Many of her original drawings are held by the Hunt Botanical Library in Pittsburgh. I hope that one day they will be available to all.

Two years after the appearance of Lincoln Foster's *Rock Gardening,* Timmy published a book entitled *Keeping the Plants You Pick* (Crowell, 1970). This book deals with pressing and other ways to preserve plants and with their use as ornaments on various subjects such as lamp shades or place mats, thus revealing again, on a humbler scale, her interest in conferring permanence on transient beauty.

In the autumn of 1985 Timmy gave the Connecticut Plantsman Lecture, which was subsequently published in the *Bulletin,* Vol. 45, No. 1, pp. 1–20, 1987. At the end of the lecture, in splendid prose, Timmy talked with delight about her self-chosen role as weeder of the great garden at Millstream. Not many of us would choose weeding as our favorite gardening activity, but we must remember that Timmy was primarily an artist and had the true artist's rage for order.

With aristocratic reserve Timmy never talked about her relations with her husband, but it is crystal clear that they were mutually supportive of each other, as was only right and proper for the royal family of American rock gardening.

—Howard Porter



Laura Louise (Timmy) Foster

A Short Survey of the Flora of the Mt. Hood Region

Ken Love and Floyd McMullen
Portland, Oregon

Oregon's remarkable plant species diversity is directly related to equally varied plant habitats. The Cascade Mountain Range represents one of these ecosystems. It extends from California's Mt. Lassen to north of the Canadian border. The Cascades, in Oregon, are mainly volcanic and form a boundary between the western third and the eastern two–thirds of the state. Climatically the western part is termed "winter–wet" and "summer–dry." Much of the eastern two–thirds is desert or near desert. The extremely low summer rainfall over the entire state has produced a drought–resistant flora.

The Mt. Hood region, to be featured at the 1988 ARGS Annual Meeting, is typically "Cascade." The flora has less of the northern influence evident on the magnificent Mt. Rainier, likewise less Rocky Mountain influence than on Mt. Adams, a near neighbor to the northeast. The intention here is to provide limited background on an area that extends from the McKenzie River to the Columbia and from the west base of the Cascades to the Deschutes River on the east, that is, about the northern third of the Oregon Cascades. The focus of interest is Wy'east the mountain.

Wy'east is the ancient Indian name for Mt. Hood. The theme of the 1988 Annual Meeting, Wy'east Timberline Trails, features Wy'east from the humid transition through the Canadian, Hudsonian, and arctic–alpine life zones. The altitude range on Wy'east exceeds 11,000 feet and the climate transition west to east is equally dramatic. Slide presentations at the meeting are aimed at developing a further appreciation for the region.

The 40–mile–long Timberline Trail circles the mountain at an average elevation of 6000 feet. Glacial streams have cut canyons down to about 2000 feet, so there is a lot of up and down involved. Around 450 higher plant species are at home on the mountain. No attempt is made here to list each of them. Two excellent floras are readily available. *Flora of the Pacific Northwest,* Hitchcock and Cronquist, Seattle, University of Washington Press, 1973, features line drawings of each species by Jeanne Janish. The older *Manual of the Higher Plants of Oregon,* Morton Peck, Portland, Binfords and Mort, 1961, lacks illustrations, and reflects a now unfashionable "splitter" approach to the flora, but it does have the advantage of covering the whole flora of Oregon, including the Cascades, Siskiyous, Wallowas, Steens, Warners, Strawberry, and other mountain chains. Hitchcock and Cronquist is limited to the Columbia River drainage basin.

Among the families represented on Wy'east are the following:

Liliaceae (Lily Family)—20 species, including the showy *Xerophyllum tenax* (bear grass), *Erythronium montanum* (avalanche lily), and *Lilium washingtonianum* (Mt. Hood lily) which, despite the name, never made it north of the Columbia River.

Orchidaceae (Orchid Family)—12 species, including three ghost orchids and the widespread *Calypso bulbosa.*

Polygonaceae (Buckwheat Family)—10 species, including the choice *Eriogonum ovalifolium* and the bright yellow *E. umbellatum.*

Portulacaceae (Purslane Family)—5 species. Most noteworthy is *Spraguea (Calyptridium) umbellata* (pussypaws). It is colorful when the leaves take on bright hues. The more perennial *S. umbellata* var. *caudifera* makes respectable buns.

Ranunculaceae (Buttercup Family)—24 species, including some nice buttercups and six anemones. *Anemone (Pulsatilla) occidentalis,* the grand mountain pasque flower, ranks among the world's finest pulsatilla types.

Cruciferae (Mustard Family)—8 species, including *Smelowskia ovalis* which is generally credited with living highest on the mountain.

Saxifragaceae (Saxifrage Family)—22 species. The genus *Saxifraga* numbers nine species, among them the beautiful little *S. tolmiei,* the despair of most rock gardeners.

Grossulariaceae (Gooseberry Family) now lumped with Saxifragaceae—9 species. Here is the spectacular *Ribes sanguineum* (red flowering currant, a spring companion for the hummingbird).

Rosaceae (Rose Family)—36 species, including roses, strawberries, salmonberries, thimbleberries, three choice species of prostrate *Rubus,* and the 3–inch *Luetkea pectinata* (Alaska spiraea).

Leguminosae (Pea Family)—14 species. Several colorful lupines. Most appealing is *Lupinus lyallii* now *L. lepidus* var. *lobbii.* Why doesn't it like us well enough to live with us?

Ericaceae (Heath Family)—38 species. Five saprophytes; seven pyrolas and the charming, tiny *Moneses uniflora;* two rhododendrons including the enigmatic *Rhododendron albiflorum;* four species and many hybrids of *Arctostaphylos;* three gaultherias; ten vacciniums, including some that are very dwarf; and the heathers, phyllodoce and cassiope.

Polemoniaceae (Phlox Family)—10 species. Phlox is better represented to the East. *Phlox diffusa* is particularly good on Wy'east. More rare is *P. hendersonii,* a real little bun.

Scrophulariaceae (Figwort Family)—40 species. Species of *Penstemon, Mimulus, Castilleja,* and *Pedicularis* add a real color splash to the mountain scene. *Penstemon rupicola* is always exciting at home on a cliff or rocky outcropping. The four shrubby penstemons found on Wy'east are among the best of the genus.

Compositae (Sunflower Family)—50 species. *Arnica, Aster, Antennaria* (pussytoes), *Eriophyllum* (Oregon sunshine), *Solidago* (goldenrod), *Erigeron,* and other species, some good, some weedy. They fill several different niches on the mountain.

In addition to those mentioned are another thirty families with over 100 species. Richness indeed for a single mountain.

Expanding the plant range to the region, rather than just Wy'east proper, gently expands the number of species. There are four irises including the little *Iris tenuis,* two or three phloxes including *Phlox adsurgens,* and *Gentiana newberryi* at its northern limit. Eight of the state's nine species of *Dodecatheon* can be found here; also *Dicentra cucullaria* and the wee *D. uniflora;* several penstemons, among them *Penstemon gairdneri,* the bright blue *P. speciosus,* and the endemic *P. barrettiae;* and several dryland violets.

The Columbia Gorge, a few miles north of Wy'east, is worthy of special note. At the eastern dry end of the Gorge, late winter (January and February) brings the first of marvelous sweeps of wild flowers. *Sisyrinchium, Fritillaria pudica,* and *Crocidium multicaule* provide the bold color strokes. Pink *Lithophragma parviflora* is a happy accent. The rosy–purple *Lomatium columbianum* is rather startling in its beauty as an individual or in masses covering a hillside. The minute but lovely *L. piperi (gormanii)* makes otherwise barren scrabble slopes appear as if they had been strewn with salt and pepper. It entirely vanishes by the end of March. Other combinations kick off the start of spring. Particularly effective is the blue and gold lupine and balsamorhiza medley. By the end of July, when the 1988 Annual Meeting is scheduled, the east end of the Gorge provides happy hunting for seeds, while the west end and the alpine slopes of Wy'east are just coming into the peak of bloom.

Oregon Cascade Natives in the Garden

David Hale and Floyd McMullen
Portland, Oregon

Ira N. Gabrielson published *Western American Alpines* in 1932. A foreword by E.H.M. Cox held out hope that it would open a new era in appreciation and availability of western native plants. Over half a century later the Alpines '86 Publications Committee gave us *Rocky Mountain Alpines.*

Linc Foster's foreword closes on a hope similar to that of Cox. Those not familiar with the peculiarities of rock gardeners might be tempted toward a déjà vu attitude. But it is really the springing of eternal hope. Whether progress has been made is moot. A new crowd is looking ahead.

Neither profound advice nor any caveat is offered here, but generalized information of a few plants from a relatively small area, under 5000 square miles, including Mt. Hood and the Columbia Gorge in northern Oregon. It is assumed that each gardener best knows his or her garden's limitations, and that learning a plant's background helps make the best use of available wet, dry, hot, cold, sunny, or cool sites.

There is a climate situation here that is not generally understood. The importance of considering it cannot be over stressed. The United States Agriculture Department 1941 yearbook *Climate and Man* covers the climatic characteristics of this remarkable country. An arid zone extends from the Great Plains west to the Cascades. West of the Cascades lies a narrow strip designated "summer–dry." Here the drought in summer, wet in winter is the reverse of what occurs in other agricultural regions of the United States. To quote from the yearbook, "Native plants in the region are adapted to the peculiar climate." Though the area discussed here is small, it will be considered in four sections.

Wy'east (Mt. Hood) the Mountain

The arctic–alpine zone plants are as challenging to grow as those from similar zones elsewhere. Keep in mind the high ridges and talus slopes are quickly drained and less subject to summer precipitation than most other mountain ranges. *Anemone drummondii, Phlox hendersonii, Collomia debilis* var. *larsenii, Silene suksdorfii,* and *Penstemon davidsonii* var. *menziesii* are typical species that can be difficult. And *Saxifraga tolmiei* is downright cantankerous.

Lower on the mountain are the colorful meadows usually referred to as parks. *Anemone (Pulsatilla) occidentalis,* at home here, takes a cue from the pulsatillas of the Alps. Consider yourself special if it smiles upon you. The heathers (phyllodoce and cassiope) are more tractable. *Erythronium montanum,* the avalanche lily, sometimes retreats to open woodlands. Enjoy it in its mountain splendor. Its garden retreat is total!

Timberline and lower are a large number of saprophytes and other plants that enjoy coniferous duff. *Chimaphila umbellata* var. *occidentalis* and the smaller *C. menziesii,* are particularly attractive. Of the several pyrolas, *Pyrola asarifolia* var. *asarifolia* (*P. bracteata*) is a standout with its glossy leaves and pink to red blossoms. Creating long–term garden conditions that suit highly adapted plants is a demanding task. The never–say–die rock gardener will continue to hope for good-natured clones that are less fussy. At all altitudes castillejas are a blaze of color. They also present a special problem with their parasitic nature. Sow seeds and hope. Hope that a few will find hosts to their taste.

Wy'east Eastward

The douglas fir to pine transition dramatizes the crossing of the Cascades. *Arctostaphylos columbiana* yields prominence to *A. patula.* In the Mt. Hood vicinity incense cedar (*Calocedrus decurrens*) and the Mt. Hood lily *(Lilium washingtonianum)* are at their northern limits. *Ceanothus prostratus* is close to its northern limit. Odd little *Dicentra uniflora* becomes more common. Going eastward the pine community gives way to the true arid zone that extends to the base of the Rockies. It should be pointed out that the arid region is tremendously varied. There are sandy soils where juniper is king and *Leucocrinum montanum* is at home; gumbo soils that turn to concrete by June where *Phlox caespitosa (douglasia* ssp. *rigida), Penstemon gairdneri,* and *Phoenicaulis cheiranthoides* may be found. Winter and spring wet spots dry out by summer's onset causing most plants found there to go dormant and disappear in the dry season. Lovely little *Hesperochiron pumilus* and *H. californicus* along with several *Dodecatheon* species like such a habitat. Additional species of *Penstemon, Phlox, Astragalus,* and others appear in the arid area.

Wy'east West and South

The lower Cascades summits are home to *Douglesia laevigata.* It is strictly a cliff dweller in the Cascades. Companions are often *Saxifraga caespitosa, S. bronchialis, Sedum spathulifolium, S. oreganum, S. oregonense, Polystichum lonchitis, Cheilanthes siliquosa, C. gracillima,* and *Gentiana calycosa* var. *calycosa.*

The lower woodlands and open areas produce *Iris tenax, I. chrysophylla,* and the endemic *I. tenuis.* An example of summer-dry: these Northwest natives are much more summer drought resistant than, for instance, *I. cristata.*

Many other woodland inhabitants are good plants for a large garden. When happy, they wander freely. In this category are *Gaultheria shallon, Berberis (Mahonia) aquifolium, B. (M.) nervosa, Vancouveria hexandra, Achlys triphylla, Disporum smithii, D. hookeri* var. *oreganum, Dicentra formosa,* and *Oxalis oregana.* When established, all are resistant to summer drought. There are, of course, many well-behaved woodland species. To name a few that would do credit to any garden: *Synthyris reniformis, Viola sempervirens, V. orbiculare, Rubus nivalis, Coptis laciniata,* and *Isopyrum hallii.*

The Columbia Gorge

The Gorge is so special, scenically and botanically, it is understandable that it has a dedicated following. As a newly established National Scenic Area, it has a designated watchdog Gorge Commission to oversee development. The Columbia River here has sliced through the Cascades at near sea level. The west/east transition with practically no elevation gain is as dramatic as a Cascade crossing at any other point. Annual precipitation is 38 inches at the west end, 76 inches at midpoint, and 14 inches at the east end. It is an excellent laboratory for observing plant adaptation. East of the mountains, plants penetrate westward and west of the mountains, species return the courtesy. Here is probably the only area where a synthyris of the missurica persuasion, *Synthyris stellata,* intermingles with *S. reniformis.*

Then there is the vertical migration. Several species normally associated with higher elevations have descended to near sea level and appear to be happy with the decision. Examples are *Phlox diffusa, Penstemon rupicola,* and *Douglasia laevigata.*

There is a spot where a walk of under a half mile puts much of the gorge together with a scenic waterfall, one of many in the Gorge, and a plant–covered vertical cliff. The species count in the small area is exciting, including *Sedum, Saxifraga, Douglasia, Synthyris, Delphinium, Penstemon,* and two endemic erigerons *Erigeron howellii* and *E. oreganus)* and others.

The first bloom in local gardens starts the blood rushing in local rock gardeners. It may be as early as late January. A telephone call to ask, "How about a trip up the Gorge?" And off we go. The earliest mecca is a spot on the Washington side where the southern exposure gets things stirring a little earlier than Oregon's north–facing slopes and cliffs. What to expect? Acres of grass widows, *Sisyrinchium douglasii;* yellow bells, *Fritillaria pudica;* fat leaves of the bitterroot, *Lewisia rediviva,* soon to wither away to make room for the blossoms; *Dodecatheon poeticum;* deliciously pink *Lithophragma parviflora.* That's not all, but it's a hint of the anticipation and satisfaction of "a trip up the Gorge."

Now a mere listing of these various species growing in close proximity could lead one to believe that they could be grown together in the garden. If that were only so! Each has its own micro–system: the sisyrinchium near a vernal bog, the lewisia atop rocky ledges, the dodecatheon close to flowing water. Successful cultivation? Simple. Repeat the conditions, and import an arid climate. Take heart and have a go at it. Note that the plaintive question is so often posed, "Why doesn't my *Gentiana acaulis* bloom?" And no one can give a sure fire answer.

Friendly Natives

Morris West
Red Lion, Maryland

If recent conferences in Asheville and Boulder didn't convince you that a wealth of suitable rock garden subjects exists in our own backyard, my words will probably be ineffective. However, it appears to me that most rock gardeners continue to favor immigrants over some equally desirable natives. Among choice evergreen or almost evergreen specimens alone, the selections are numerous. While claiming to be no expert, I have had some notable successes.

Full sun and a neutral to slightly acid soil with perfect drainage seems to please *Leiophyllum buxifolium* var. *prostratum* which responds with dainty white stars in spring and bronze–toned foliage in winter. Similar conditions, excepting a more alkaline soil, have proven effective for several shrubby penstemons including *Penstemon caespitosus* 'Claude Barr,' *P. davidsonii, P. teucrioides,* and *P. pinifolius. Conradina verticillata* as well as several species of *Opuntia* share this environment.

The rich, moist composted peat of a small bog suits *Vaccinium vitis-idaea* var. *minus* almost too well. Although flowers and fruit are scarce, the handsome foliage is reward enough.

In shaded corners of the rock garden or the woodland garden with a humus–rich loam, a number of choice woodlanders find an agreeable abode. *Comptonia peregrina,* while somewhat reluctant to become established, will, if satisfied, develop into attractive background focal points. Plantings more suitable for the foreground of the average–size shaded rock garden include numerous species and cultivars of the *Asarum/Hexastylis* group exhibiting beautiful foliage variation. Especially desirable cultivars carry such designations as 'Calloway' and 'Silver Heart.' Worthy companions could be *Paxistima (Pachistima) canbyi* var. *compacta, Shortia galacifolia, Galax urceolata (aphylla),* and *Epigaea repens,* the last three producing an attractive floral display in the spring as well as beautiful evergreen foliage. The shortia leaves develop a striking crimson color for added winter interest.

One of my personal favorites for any woodland garden is our native Allegheny spurge, *Pachysandra procumbens.* This is a plant that deserves much greater use. Equally effective as a single specimen or in a mass planting, I find this species infinitely preferable to its ubiquitous immigrant cousin. Admittedly the foliage can become rather bedraggled late in a very cold winter without snow cover, but 10 months of duty is yeoman service to me. The short spikes of early spring flowers while not showy add a subtle effect and give way to the clumps of matte olive-green leaves which combine well with small delicate ferns. Cool autumn weather produces the attractive foliar mottling which in mild winters or with dependable snow cover remain in good condition until spring. In 1966 Walter Kolaga wrote, "This native of the Alleghenies is scarcely known to American gardeners, but it is a handsome ornamental." Unfortunately this observation still appears valid 20 years later. Probably due to its relatively slow growth rate, it is not commonly available, but a little research should uncover a commercial source.

Ever diminishing wild populations of most of our choice native flora should give special impetus to our including more of these beautiful ornamentals in our gardens.

Still More on Winter Aconites

Jerry Flintoff
Seattle, Washington

The name *Eranthis* x *tubergenii* dates from 1924 when that grand old gardener and bulb expert E.A. Bowles reported on the exhibit of a plant of this name before the Royal Horticultural Society in February of that year. The plant had been raised by the brothers Hoog of the Van Tubergen nurseries probably several years prior to 1921 when Bowles states he first grew it.[1] The plant was first commercially offered by Van Tubergen in 1922.[2]

The plant has been excellently illustrated, first by Bowles with one of his incomparable black and white drawings[3] as well as more splendid colored illustrations in *Addisonia*[4] and in *Curtis's Botanical Magazine*[5].

The hybrid plant has been known to be sterile from the earliest days—as duly noted by Bowles—and repeatedly down through the ensuing years, as by W.B. Turrill in 1952[6] and by Thomas Hogg, who had known the plants from their beginnings, in 1960.[7] In the memorable lecture on bulbous plants given by Paul Christian at the Hardy Plant Study Weekend in June 1985 in Seattle, Christian admitted that the statement in his descriptive catalog re *E.* x *tubergenii* and the production of seed was false and the plant offered at that time was wrongly named. He had discovered that the true clones, consisting of 'Guinea Gold,' 'Glory,' and several additional unselected clones from the same original cross, were and are all sterile.

My experience has been that much of the material distributed as *E.* x *tubergenii,* both as tubers and as seed–exchange material, tends to produce winter aconites indistinguishable from the European broad–lobed and relatively small–flowered *hyemalis* type, rather than the narrow–segmented and relatively large–flowered Turkish type usually sold as *E. cilicica.*

Those who have studied these winter aconites in their total natural range have found that the Turkish *E. cilicica* is connected to the more typical *E. hyemalis* types by innumerable intergradations, so that *E. cilicica* is not even considered upholdable as a variety of *E. hyemalis.*[8] [9] As a very distinct garden plant, however, it would be perhaps best to list these narrow–segmented types as *E. hyemalis (cilicica).* These tubers, incidentally, are probably wild–dug from Turkey and their purchase should be discouraged, both from a conservation point of view and a practical point of view as well; they do not withstand drying at all well, and most tubers from bulb distributors fail to grow.

Since *E.* x *tubergenii* represents only a cross between members of the same species, as now understood, it would be best to label it (when one can obtain these elusive beauties) as *E.* 'Tubergenii' or as *E. hyemalis* 'Tubergenii' for the several unselected and very similar clones still extant. The selected clones 'Glory' and 'Guinea Gold' can be treated as cultivars of *E. hyemalis* without the designation 'Tubergenii.''

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Metamorphosis

Elizabeth Rodgers
Ipswich, Massachusetts

I wish I could look back to 1977 when Sam and I bought our house with 5 acres on Heartbreak Road in Ipswich, Massachusetts, and say, "Of course, I saw potential in the gravel pit for an incredible rock garden," but I can't. Ten years ago I had never grown a flower of any kind. In a way, this was a blessing. So excited were we to find something different that I don't remember thinking much one way or another about the gravel pit. And one certainly can't get further from the norm than buying a house that looks like a spaceship with windows, set down in the desolation of an old gravel pit.

Those early years were devoted, primarily, to finishing the house and making the surroundings look somewhat habitable. We had dense brush, denser poison ivy, and no top soil anywhere. The only clearing was a flat area of gravel in front of the house, which faced south directly into the gaping 40–by–60 foot mouth of the pit, 30 feet away. This part of the pit, with its steep, gouged overhang and scant scrub of poison ivy, poke weed, and bitter-sweet, was where we concentrated our first attack. Sam insists he had an idea of what we were trying to achieve, but I certainly didn't.

Our priority was to fill in that gaping part with something other than the pink insulation and building materials left by our predecessors. An obvious solution would have been soil but having bought one truck load of *cheap* (a relative term) unscreened soil full of bedsprings, sparkplugs, and glass for our vegetable garden and lawn, our budget rebelled. We used, instead, what was available, the brush from the scrub we were clearing, and leaves. Had we inquired, someone might have suggested a shredder. As it was, that marvelous implement of destruction, so dear to my heart now, remained undiscovered until post pit.

For 2 years we cut and hauled and jumped, literally, on the brush to try to pack it down into the abyss. This tribal ritual culminated in the covering of it all with sand from the overhang. The house then faced a large vertical sandbox separated by a fledgling lawn of grass, glass, and sparkplugs.

The solution to the sandbox problem was easier. We hauled rocks up from a stone wall in our swamp and made four terraces. All that needed to be done then was to plant the 40–by–60 foot monstrosity! I drove to a Weston nursery, described my situation, and was introduced to the plants they felt adaptable to our special conditions: basket–of–gold, moss pinks, snow–in–summer and thymes. Now to any gardener, which I was rapidly becoming, and to any artist, which I already was, 2400 square feet of the above plants, no matter how skillfully arranged, spelled BORING.

At this crucial time, I uncovered, dormant within my inner being the roots of a true rock gardener; I turned to my heretofore *vegetable* seed catalogs and looked, for the first time, at the flower sections. I was dazzled by the wealth of material and intrigued by the term *perennial.* The flowers of my childhood were of the zinnia, petunia, geranium genera. This new concept of planting once, spreading, dividing, etc. was the answer to our prayers. I was hooked. I went wild, and thankfully, I forgot to pay attention to my "special requirements" and planted anything that caught my fancy. I am still amazed at how many things will grow where they shouldn't.

About this time our dear friend and fairy godmother, Mrs. Albert Burrage, took a hand. Long acquainted with gardens and gardeners, having been a founding member of the American Herb Society, and married to the author of *Burrage on Vegetables,* she gently but firmly deposited me into her local garden club. Here I was to meet and gather knowledge from many wonderful gardeners, the most influential of whom were Margot Parrot, and Catherine Hull of rock garden renown. I will admit that by this time I was hooked on gardening, but it wasn't until I met these two women and saw their gardens that I understood what a true addict was and instantly became one. An addict of the worst sort: one who makes gardens out of every available space; lives 8 months of the year in rubber boots and rags; breathes seed lists, slug hunts, and soil mixes; and dreams of compost, manure, and pea stone.

The dilemma of what to do with my monstrosity became more of a what else can I do? and where could I put a woodland garden? what could I grow in my bog? and where, oh, where would I put all the minute treasures I was coming to know and love? The terraced rock garden was primarily a garden to view from the house, below, or above; little treasures were quite literally lost. My first *Lewisia columbiana,* triumphantly grown from seed, was planted somewhere on a terrace, thought perished, and found a year and a half later, thriving. It was then I began envisioning everything in sight from the house, and some not, as garden.

Out came the weeds and brush from either side of the terraced part of the gravel pit. The slopes were slightly less acute here, and shaded, necessitating a hasty interest in woodland ground covers. The bare bones of the pit were becoming visible and the undulating contours were beautiful. On the eastern edge of the site, near the house, a bulldozer had for some unknown reason excavated a 3–by–30 foot tree–lined trench to nowhere—a perfect path begging to be flanked with lush woodland gardens, drawing one out to the back yard and down to the bog. I was skeptical at first about gardening in a bog and began slowly with marsh marigolds and *Primula japonica.* There's no turning back now!

But best of all, just finished last year, is the western side of the pit (eastern exposure) where the contour meanders around and out the drive descending gradually from 40 feet to ground level. This is where Sam, with more rocks from the swamp, built a magnificent 140 foot by 3–to–4 foot wall á là Lincoln Foster/Catherine Hull, though I can proudly say his creation is uniquely Sam Rodgers. He planted as he went every nook and cranny with plants I'd grown from seed or cuttings propagated in the mister (gravel pit begot rock gardener, begot green house, begot mister, begot...). Behind this wall is our scree bed, mulched in pea stone, rapidly filling with treasured plants from friends, grown from seed (ARGS and AGS), from cuttings, and now even self–sown.

This will be the second spring for this treasured part of the garden. We hope it will be as spectacular as last, maybe more so. It will also be our last spring. We're moving to western Massachusetts where I've heard the climate is even better for alpines. We hope as many of you who would like to, will visit our garden this year. We have our fingers crossed that whoever buys it will want to carry on, and if they are not already gardeners, they will be smitten by the bug as we were. But, alas, you can never tell.

My Card File Box

Barbara van Achterberg
Easton, Connecticut

As Voltaire was said to feel about free speech, I feel about labels in the private rock garden. Though I will defend to the death your right to have them in your garden, you will not find them in mine. I might stick a twig in the ground next to a newly planted seedling to remind myself to give it extra water for a few weeks, but each plant is required to call out its own name. Some, like *Arisaema sikokianum* and *Primula rosea,* do this better than others (campanulas and dianthus, for instance). So how do I remember what's planted where?

I consult my file card box. This is an ugly beige 3–by–5–by–5 inch plastic box that replaced a prettier but smaller one which I outgrew after 5 years of rock gardening. After 7 more years I have not outgrown this box because I frequently revise the cards within it.

The first section in my rock garden file card box contains miscellaneous cards and papers. At the moment it holds a receipt for coffee and supplies purchased for the last meeting of the Connecticut Chapter; my donor number

(126) from the seed exchange; a list of seeds, plants, and bulbs currently most desired by me (*Scilla rosenii* and *Dicentra peregrina* are the first names on the list); a list of things I have that other rock gardening friends would like (Ellie S. wants *Hepatica transsilvanica* and my carrot cake recipe); a credit for $12.94 from Greer Gardens; some notes on alpine houses and plant propagation; some ideas for troughs I hope to make; and a letter from a rock gardener in Canada. All of these take less than an inch of depth in the file card box.

An even smaller section records seeds sent to ARGS every year since 1977 and seeds received from ARGS and other sources. Each year the seeds received have been listed alphabetically with dates of sowing, germination, and eventual transplantation to the garden (or failure at any step of the way). Since after 2 years seeds which do not germinate or which germinate but die as seedlings are thrown somewhere in the garden, I then have a record should some mysterious stranger appear.

The next small section of my file card box lists the location and the contents of each of my five damp gardens (bathtubs and sinks sunk so that their rims are just below the surface). After that a tiny section describes the contents of my four troughs.

The main part of my file card box, about 3½ inches in depth, is divided into two parts: "Plants in My Garden" and "Plants Worth Growing." Each of these sections is alphabetized by genus.

Whenever a plant is introduced into the garden, its name is written on a card. I specify its origin, the date, and the nearest more or less permanent garden features. From time to time I note its progress. Here is a verbatim entry:

> *Crocus tommasinianus*—wonderful deep purple bought in bloom from Oliver's 3/86. Planted under *Styrax japonica* next to *Adonis amurensis.* Brilliant combination! (3/87)

I have three cards, with entries on both sides, for crocus in my garden. I do not try to alphabetize the species but simply make an entry when planting, transplanting, or noting anything about any crocus. I do try to leave a little extra space for future comments about each species.

If I lose or decide to eliminate a certain plant, I draw a line through its entry with the date of demise. But if it is a plant I want to try again, I make an entry on a card for the same genus in the last section of my file card box, "Plants Worth Growing." I note the date of my attempt to grow it and the location in which it died, as well as any cultural notes. Then, if I grow it again, I can try other sites or methods.

When I see a beautiful plant in another rock garden or a slide of some treasure at one of our ARGS meetings, I quickly jot down relevant facts on any sheet of paper. Then when I get home I make an entry under "Plants

Worth Growing." Here is one:

> *Phlox alyssifolia*—beautiful South Dakotan, sends underground stolons, but they are hard to propagate from cuttings (Linc Foster).

Even though I may not have spelled the specific name right, I will recognize if it I ever meet it in a seed list. By the way, I have four cards for Phlox under "Plants in My Garden" and five under "Plants Worth Growing."

That is how I use my file card box. Thanks to it, I know exactly how many years my *Daphne cneorum* 'Eximia' has been in the garden (10) and how many years it took me to bring *Crocus banaticus* to bloom from seed (5½). By pinpointing the locations of my various campanulas, I can tell them apart (at least until they interbreed). The cards tell me which plantings of *Iris cristata* are blue and which are white, in case I want to dig some up out of bloom for someone.

The only discipline which is required for my low–tech record keeping system is to be sure ALWAYS to make an entry every time any plant is put in the ground or moved. When planting a quantity of plants, I must either run indoors and write entries frequently or carry the box around with me.

Other entries can be made at leisure. Occasionally the cards for a whole genus will get so messy, with arrows, crossed–out lines, and crowded updates, that I will pull out all the cards for the genus and revamp them.

That's all there is to my file card box. I recommend it to other rock gardeners who want to know what's in their garden, or what should be in their garden, but who don't want labels.

European Notebook:

La Rambertia

Paul Halladin
Geneva, Switzerland

High up above Montreux, Switzerland, on the top of a mountain called Rochers de Naye, is a very old botanic garden with an unusual history. The garden was started in 1892 by M. Scheluchine, a Russian emigré botanist domiciled in Switzerland. He was encouraged and aided in his task by the renowned Henry Correvon of Geneva. Unfortunately, Mr. Scheluchine had to abandon the project because of ill health. His work was resumed in 1894 by another Russian emigré botanist Mr. Arthur de Janckzewski who also founded the first botanic society of Montreux. The garden was named Favratia by this society in honor of the poet Louis Favrat (1827–1893) who was also a former curator of the botanic museum in Lausanne. Mr. Janckzewski moved the garden to a different location on the northern slope of Rochers de Naye. As it turned out, this location was too cold and humid for most of the species introduced, and he too gave up on this difficult project.

On June 7, 1896, the original society was dissolved, and on June 8, a new society, La Societé de la Rambertia, was formed with Henry Correvon as its first president. He remained as president from 1896 until retirement in 1935 at the age of 81. This new society renamed the garden La Rambertia in honor of the Swiss poet and naturalist Eugene Rambert (1830–1886) whose original botanic specimens (mostly plants indigenous to the Swiss mountain regions) are still preserved by the Botanic Institute of Lausanne. The society took it upon itself to continue the work of the Russians and attempted to expand the knowledge of gardening at high altitudes. The garden was moved again to its present location on the crest of a ridge in a slight saddle between two peaks. The garden, then and now, encompasses an area of about 12 acres. Only a tiny portion, perhaps a little less than a half acre, is actually cultivated. The major part of the garden has always been kept in its original natural state, protected as a reserve for indigenous species.

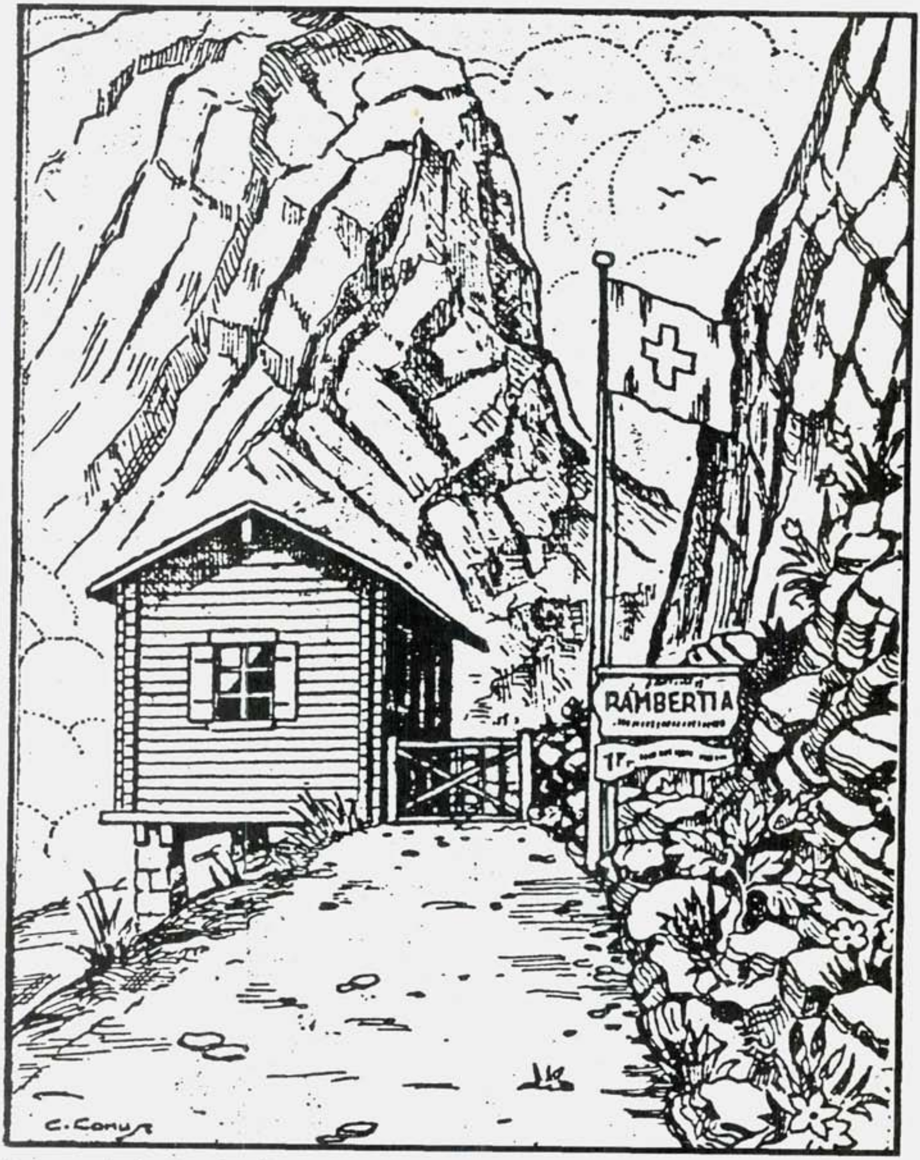
Recognition came in 1904. La Rambertia was the meeting place of the First Congress of Alpine Gardens on August 17. Prince Roland Bonaparte of France was the chairman of this congress, which was attended by an illustrious assemblage of the leading professors of botany from France, Italy, and Switzerland who were interested in alpine flora.

Even though the garden is small, there is much to see at any time from late June until early October. The absolute height of bloom is normally between the third week of July and the fourth week of August. On a visit in late August 1986, one could see large plantings of *Delphinium cashmeriana, Geranium argenteum,* and *Potentilla ambigua* all in full bloom and thriving. Noteworthy too was a collection of various species of dwarf *Leontopodium* of far eastern origin, quite effectively used in fairly good-sized groupings as a sort of ground cover. Among the many species of *Campanula* represented here, *C. raineri* seemed to be especially floriferous. One curiosity, *Astrantia maxima (helliborifolia),* even though 18 inches tall, seemed appropriate and added a touch of the exotic with its pale dusty-rose flowers and large bracts. Another curiosity was an old and rather large plant of *Aubrieta gracilis,* originating in Greece but seldom seen in Swiss gardens. It had been planted in a tight crevice on the cliff face. Its growth habit is similar to the very common *A. deltoidea,* but its leaves are smaller and of a much harder texture. The flowers as well as the seed pods are held on short stems about 2 inches above the foliage.

Gardening at this altitude (about 6500 feet and well above the tree line in this location—a true alpine zone) poses special problems. Deep snow cover is normal every winter, usually ranging well in excess of 6 feet. Over 15 feet is not uncommon and as much as 36 inches has fallen in one night. This is, of course, quite beneficial to many plants, but it also constricts the time period in which work can be done. During the very short growing season, a perennial problem is the tendency for rather long dry spells, sometimes as long as 4 weeks. The soil is quite permeable and drains too rapidly. This is particularly hard on newly introduced species. A special tank with a capacity of 1100 gallons was constructed in the garden to collect rain water at the site. No ground water or tap water is used in the garden.

It is interesting to note the odd mixture of plants in a garden of this type. For example, it might be expected that *Saxifraga oppositifolia* would thrive and form rather large cushions. But then why does *Echinospartum horridum,* planted over 75 years ago during the Correvon era, also do so well, not more than a dozen feet away, when it is really a sun lover from the much warmer and dryer areas of Spain? Another unusual sight was an extraordinary and near perfect specimen of *Helichrysum milfordiae* with twelve paper-like flowers that were so identical in size and shape they appeared to have been stamped out of a special mold. All were at exactly the same 2-inch height and all were perfectly level, not one even slightly tilted. This was my own first observation of this plant in flower grown in the open. Incidentally, this plant, according to the records, is over 10 years old and has bloomed every year for the past five.

A visit in early October indicated that some plants can well withstand a number of frosts. There were more than ten species still in bloom in spite of the cold. Outstanding was a particularly floriferous form of *Gentiana olivieri,*



Entrance to La Rambertia

also a large white–flowered *Dianthus crinitus,* and again those attractive far eastern species of *Leontopodium,* notably *L. leontopodiodes (sibiricum), L. hara,* and *L. kitamura.* Many campanulas were also still in bloom. Temperatures below freezing are quite normal at night in late September and October. In fact, frost, hail, or snow can strike at any time during the growing season, but usually only at night.

In the year of the first formal opening of the garden in 1906, 1232 persons visited the garden. In 1985 the count was over 7300. A contribution of one franc (about 60 cents) is requested of visitors in order to help cover the cost of maintaining the garden. The number of visitors is determined by the amount of money received, so it is entirely possible that the actual count of visitors could be substantially higher. During the height of the summer season, students from Montreux who are volunteers interested in botany are present every day to answer routine questions and to observe visitors paying their contribution. After school sessions resume, in late August, the garden is almost always unattended, except on Saturdays. It is on this day that one can usually find Monsieur Pierre Rosset, of the Lausanne Botanic Garden, present. He is occasionally assisted by various members of La Rambertia Society as he performs the numerous tasks necessary to keep the garden well tended.

The original introduced species count in the cultivated part of the garden in 1896 was 650. Currently the garden contains about 1000 species from Europe, Asia, and North America. Each year some new plants are introduced, some of which are purchased, some from contributions, and some from seed or cuttings propagated at lower levels. Replacements must also be provided for the inevitable casualties. This year, over twenty boxes of new plants were put in place, partly to replace casualties but also to expand the garden somewhat.

During the fall months M. Rosset collects seed and exchanges them with over thirty other botanic gardens. During the winter months, he updates the society's records and files. A complete record is kept on every plant introduced including its location; therefore, M. Rosset was able to point out a plant of *Rhododendron hirsutum* still in the same spot where it had been planted by Henry Correvon in 1896. In addition, there were over ten other plants still surviving from that year including *Androsace helvetica, Eryngium alpinum, Cymbalaria (Linaria) pallida,* and *Wulfenia carinthiaca.*

All of the necessary materials for the garden are brought up to the terminal at the peak via a cogwheel railroad and are then transported by wheelbarrow to the garden. It is in this manner that silica sand and peat moss are brought for plants requiring acid soil conditions. All the soil and stones on the peak are calcareous. The stones are mostly a gray, hard, and fine–grained limestone of the Malm (Upper Jurassic).

The cogwheel railroad that takes one to this garden originates at the main railroad station of Montreux and departs for Rochers de Naye, the summit terminal, on a fairly regular schedule. The trip up takes 55 minutes. The train makes eight stops so photographers have ample time to take pictures at various levels of the Lake of Geneva (known locally as Lac Leman) as well as the picturesque interior valleys between the peaks. There are many switchbacks and ten tunnels to traverse before the terminal at the top.

On the way up one notices large amounts of lichen on the branches of the trees located just below the tree line, an indication of the high level of humidity due to the often present clouds at that height. On the morning of the day we arrived, the clouds were so thick that it seemed like a dense fog, but eventually the sun broke through and the only clouds that remained were those in a layer around 4000 feet, well below the peaks.

The cultivated part of the garden is situated about 600 to 700 yards from the rail terminal at the top. The path is fairly level and presents no danger as long as one stays on the path. The garden itself is well fenced, particularly in places that border on steep drop offs, so one need not fear walking about and exploring all the numerous nooks and crannies of this true mountain garden. Narrow paths wind in and about the extensive stonework and terracing that had to be done in order to retain soil for the planting areas. There are few level places larger than 2 feet by 4 feet. As one stands in the entrance of the garden, it is easy to understand why a botanist would want to start a garden in such a location. One can also understand the dedication of M. Rosset who has toiled here so faithfully every Saturday and for every summer during the past 19 years.

The return rail trip, on the October visit, provided a rare treat in that as the sun shone through a light haze over the lake, it created a golden orange reflection on the surface of the lake, far below, in a path that reached from shore to shore. The very slight waves on the lake were sharply silhouetted in what appeared a broad river of gold through the lake. Then as a small boat cut through this pattern in a curving path, it was as though someone had drawn a stick through carefully raked sand. Though romantic and extravagant outpourings are no longer in fashion, the spectacular views and the emotions thus aroused could make almost anyone understand why an individual might possibly be moved to the point of verbal excess.

The area around Montreux has inspired artists, poets, authors, and composers for well over 200 years. As early as 1816, Lord Byron wrote about this area, and in more recent times, Vladimor Nabokov, the famous novelist, sought inspiration here during the final years of his career.

One must not neglect to spend a little time in Montreux either before or after a visit to La Rambertia, for there are special treasures here for the traveler. It is not by chance that visitors come back again and again, lured in part because this outstanding resort is perhaps one of the most beautifully situated in the world, but also by the balmy breezes wafting off the Lake of Geneva. This popular "Belle Epoch" town enjoys a remarkably mild climate thanks to the surrounding mountains which protect it from the frigid north and east winds during the colder months, yet it has a fine open situation because of the vast expanse of the lake.

As one walks the streets above the lake route in the older more quiet parts of the town, one is instilled with a certain nostalgia for those more sedate times when ladies wore crinoline and carried parasols to ward off the rays of the noonday sun. It was during such an era that the rock garden of La Rambertia was conceived as an attraction for the botanically inclined who sojourned in this elegant spa of yesteryear.

As a fitting climax to the day's activities, one should remember to stroll along the edge of the lake on the famous and popular Chemin Fleuri (Flowered Path). This flowered path consists of a series of gardens and floral displays mounted by the professional gardeners of five different districts along the lake, encompassing a continuous path of over 5 km. Each district attempts to construct the most attractive floral display, in a sort of friendly rivalry. The path is elegantly wide, and one can walk easily from one planting area to another. Each area is set with interesting sculptures and many unusual shrubs and trees as well as massive floral displays. In a way, this is a type of botanic garden, but quite different, in that it is very long and narrow, stretched out all along the lake. There are few botanic gardens anywhere with the special ambience of this wide lake and the spectacular panorama of the massive snow–capped mountain range rising abruptly on the opposite shore.

Many of the trees and shrubs have labels indicating their Latin names. Of particular interest in just one short walk: the evergreen *Cupressus arizonica;* a Chusan palm, *Trachycarpus fortunei; Ehretia dicksonii* from Taiwan; a graceful very old specimen tree of *Sequoiadendron giganteum 'Pendulum';* and a *Magnolia* x *soulangiana* reputed to weigh in excess of 220 tons. In all there are over ninety different unusual and/or rare tree species in forty marked zones including many from semi–tropical or tropical lands. Many of these trees should not really be able to survive at this latitude, about the same as Montreal, Canada. The fact that they do survive is a testimony to the remarkable microclimate of Montreux.

Special mention and our thanks to M. Edgar Styger, president of Le Societé de La Rambertia who provided records containing details of the early history of the garden and the society. Special thanks also to M. Pierre Rosset who provided many details about the garden and individual plants.

Thlaspi arcticum vs. the Oil Conglomerates

Ronda Engman
Spencer, New York

Thlaspi arcticum—Look it up in just about any rock garden book, *Hortus Third,* or the Seed List and you won't find it. But *T. arcticum* does exist, though I can't tell you exactly what it looks like. Let's assume that it looks much like other thlaspis and leave it at that. Its appearance is not really important.

What is important is where *T. arcticum* lives. Its home is the Alaska National Wildlife Refuge (ANWR) in the northeastern corner of Alaska next to Canada's Yukon National Park. The ANWR is 19 million acres with 8.8 of these designated as wilderness and 1.5 million acres along the Arctic Ocean classified as coastal plain.

Besides *T. arcticum,* the ANWR includes the 180,000–member Porcupine caribou herd, brown and polar bears, lesser snow geese and about 130 other species of birds, fragile mosses and lichens, musk oxen, Dall sheep, moose, wolves, wolverines, arctic fox, the endangered bowhead whale and several other whale species and a dozen species of freshwater fish in ten inland streams. The Arctic Ocean accounts for 10% of the world's annual fish catch as well. In short, the ANWR is considered the most important biome in this hemisphere and one of the most important on the planet.

Unfortunately, a number of oil companies want to start drilling for oil in ANWR (Canada prohibits by law oil drilling in the Yukon National Park) even though the Department of the Interior's Draft Coastal Plain Resources Assessment states that there is less than a 20% chance of finding oil. If they do, it will amount to only enough to serve the country's needs for 200 days tops.

An incredible number of chemical and heavy metal pollutants result from oil drilling and oil spills do occur. Alaska's Department of Environmental Conservation reports that in 1985 alone, 82,000 gallons of oil were spilled in the Prudhoe Bay Area.

Of course, this oil drilling would probably have a negative effect on *T. arcticum,* which is currently being considered for the endangered species list.

A legislative brouhaha is now taking place in Congress over the fate of ANWR. Sides are being drawn. Both the Senate and the House have introduced bills that would declare the coastal plain a wilderness and others that would open it to oil exploration. The bills that would designate the coastal plains wilderness and help preserve *T. arcticum* are S. 1804 and H.R. 39. These bills need support. If you care to help, please write urging your two senators to support S. 1804 and your representative to support H.R. 39. You might add that you would prefer to see the entire 19 million acres of the ANWR designated wilderness to ensure the survival of *T. arcticum.*

Letters from other countries, particularly Canada, are also important and should be addressed to Senator Bill Bradley (731 Hart, Washington, DC 20510) and Congressman Morris Udall (235 Cannon HOB, Washington, DC 20515), who introduced the above bills.

Gerbera nivea

James L. Jones
Lexington, Massachusetts

Gerbera nivea, a frequent offering in the Seed Exchange, *sounds* interesting. The generic epithet suggests the showy blooms of the florist's gerbera; the specific one hints at flowers thrusting through the snow (though snow–colored is at least as likely an interpretation). The reality seemed to offer none of the above; the seed, which germinated readily, led to a 15–cm–high rosette of coarse leaves sporting seed heads 3 cm in diameter. No flowers at all! The effect, while not unattractive, definitely was not choice, and the mystery remained: whence the specific name?

It was quite by chance that I caught the plant one April doing its thing. At first I thought I had a wee new primula, from the shape of the flower; then the leaves asserted themselves, revealing *G. nivea* in a rare act of flowering. The flowers were indeed of a white persuasion, though rosier than snow white; they also appeared early enough to co–exist with snow. They were quite charming, though evanescent and occasional.

It seems to me, based on less than ardent observation, that the majority of the flowers are cleistogamous, those leading to the abundant seed heads. I further surmise that only the younger, second year from seed, plants produce the true flowers, at least I have never seen them on more established plants.

So there you have it. If your interest leads you further or if you are compulsive about filling in all fifty blanks on the seed order form, it is an easy plant to grow and self–seeds fairly readily. The seedlings, however, have endured in only a limited number of spots, characterized perhaps by good drainage and not terribly good soil. But if you put your mind to it, you can readily have a nice patch of young plants, and some chilly morning, snow or no, happening to find yourself on your knees in that particular spot, you may enjoy the elusive charm of *Gerbera nivea.*

Book Reviews

The Opinionated Gardener by Geoffrey Charlesworth with drawings by Laura Louise Foster, Boston, David R. Godine, 1988, hardbound, 197 pages, $16.95, ARGS Bookstore $11.00.

Many of us have enjoyed reprints of Charlesworth contributions to the Connecticut Chapter newsletters and are delighted to see more of his garden lore. He writes with a facile pen, a sly sense of humor, and an easy turn of phrase, drawing on his very evident expertise on his subject. The book is illustrated with exquisite drawings of alpine plants by Laura Louise Foster whose artistic talent we have been privileged to enjoy in past issues of the *Bulletin* and in Lincoln Foster's book *Rock Gardening.*

Charlesworth does not lay down the law—you must do thus and so! He merely tells how something has worked for him in his own garden. He is generous in sharing his mistakes as well as his successes. As you read the book, you visit his garden each season of the year. You empathize with him over plant disasters; you rejoice with him over the return of the hummingbird to feed on the nectar of *Rhododendron* 'P.J.M.'; over the subtle combination of plants which proved so successful; you wonder, as he tells of a clever shortcut or bit of common sense, why you hadn't thought of that yourself.

He indicates that weather and native fauna are responsible for most of the damage to the garden. Weather he can do nothing about, but he must strike a balance between the delight of seeing some of the wild animals nearby and persuading them (occasionally forcefully) to eat and dig elsewhere. He is willing to share, within reason, "We say to the birds: yes, do come and eat my viburnum berries, if possible after Thanksgiving, but on no account eat the crocus flowers. Butterflies are welcome; their babies are not. Animals keep out. My dog: Yes. Your dog: No. Worms: Eat. Ladybugs: Stay—sorry, I just sprayed your dinner."

Under "Random Species of the Garden," he lists scores of plants, some tried and true old friends, some those that have been tried and lost and tried and tried again and again and again, and those new to his garden and perhaps to yours.

Under "The Philosophy of the Garden," he says, "Your garden is like nobody else's." "We can rejoice in that diversity is one of the givens of gardening." "The only way you can have the garden you just visited is to engineer a quick sale on your way out."

Labels, keys, rock garden Latin, garden follies—he has something to say about each with at least one good chuckle per page.

The final chapter consists of brief descriptions of private gardens he admires from Vancouver, B.C. to California and eastward, stopping here and there, to Connecticut. "Hymns of praise are usually sung to the wrong people," he says. "I suppose that Miss Willmott and the others were great gardeners, but they really had a lot of help. The gardens I love are the brain-children and the brawnchildren of their owners."

This is a book to pull out, when you have an audience, and read aloud bits and pieces. I am glad, personally, that Norman Singer, Buffy Parker, and others persuaded Geoffrey to share these "random offshoots from an alpine garden" with the rest of us.

—Nan Ballard

Orchids of the Western Great Lakes Region by Frederick W. Case, Jr., Cranbrook Institute of Science Bulletin 48, 251 pages, $28.95 + $2.50 P&H, from the Cranbrook Institute of Science, 500 Lone Pine Road, Box 801, Bloomfield Hills, MI 48013 or from the ARGS Bookstore, $28.00 + $1.50 P&H.

Fred Case and his wife Roberta have put on another of their stellar performances.

Though the present volume follows the structure of the original work with the same title published in 1964, this is more than a simple revision. This is an expanded and enriched treatment of the subject based on continued exploration and research since the former publication.

The new volume contains not only updated scientific nomenclature but a whole new splendid set of colored plates plus a tremendous array of new information.

One might be put off by the limited size of the geographic region of the title, but as the author makes clear in his fascinating chapter on "Origins and Distribution Patterns of Great Lake Orchids," "At present the Great Lakes region is especially favorable to orchids because of its geographic position, its lake–influenced climate, its soil types, and its glacial history. Fifty–eight orchid species grow natively in the region, besides a number of distinct varieties within the species, several adventive species, and a number of hybrids. This region surpasses all others in temperate North America except Florida, in the number of orchid species."

Rich as the region is in orchids, their numbers wax and wane from year to year and habitat to habitat. Mr. Case has some very wise observations on this subject in the section titled "Orchids and Conservation" beginning on page 25. Near the end of the section, Mr. Case observes, "We need more documented research dealing with management methods for the maintenance and increase of orchid populations. It is still not possible to consistently grow terrestrial orchids from seed or to maintain them in propagating beds for eventual reintroduction into the wild. These skills must be developed."

He ends the section by stating, "On a short term basis, much can be done to increase conservation awareness and develop conservation policies and programs protecting native plants and animals. Unfortunately, I am not optimistic about the survival of preserves, natural areas, parks, and dedicated public lands under continued pressure from energy crises, food and water shortages, and other manifestations of human population growth."

In a separate chapter titled "Growing Our Native Orchids," Fred Case, based on many years of observation in the wild and successful growing of many terrestrial orchids in his own managed garden, has very sound advice for those who would like to undertake the difficult challenge. He admits at the outset, "Terrestrial orchids, particularly those of North America, are notoriously difficult to cultivate." Then he presents four rather sound reasons why efforts should be made to meet the challenge.

Anyone concerned with the controversial arguments about growing and propagation of rare and difficult native plants for conservation purposes should read these sections carefully. Fred Case has obviously thought hard about these problems and offers opinions based on deep experiences and deep thought.

These latter considerations are really minor to the purpose of the work. As the author writes in the introduction to this second edition, "This book is intended primarily for the amateur field botanist or naturalist. As with the first edition, this one is generally in the style of the field guide...."

It fills that role superbly with very usable illustrated keys, with lengthy descriptions of species, varieties, and hybrids and with stunning portraits of the individual orchids and good pictures of habitat.

In today's market this is a real find for the botanist, the naturalist, the keen horticulturist.

—H. Lincoln Foster

Orchids of the Western Great Lakes Region: Another View

As an enthusiastic botanist, gardener, and teacher, Fred Case draws upon years of personal experience when writing about his favorite plants, the native orchids of North America. The *Orchids of the Western Great Lakes*

Region is a revised edition of the book that appeared more than 20 years ago, and like the first edition, it is more or less an expanded field guide. It treats all the orchids, both native and introduced, found wild in the drainage system of the western Great Lakes—in other words, all of Michigan and Wisconsin and neighboring parts of Minnesota, Illinois, Indiana, Ohio, and western Ontario. Case updates the classification and nomenclature of these plants and includes information on the species and hybrids not recorded in his earlier book.

The introductory section begins with a general consideration of the Orchid Family, covering the structure of the orchid flower, the evolution of orchids and their pollination, and the few economic uses of the orchids, and is followed by more detailed chapters on "Orchid Ecology," "Origins and Distribution Patterns of Great Lakes Orchids," and "Growing Our Native Orchids."

In the laudable unit on ecology, Case traces the development of terrestrial orchids from the dust-like seeds to mature plants, which for the most part depend on a symbiotic association with soil fungi. He discusses the factors controlling the presence of orchids in various given habitats; and, unlike most floristic works, he gives much recognition to the effects of habitat disturbance, presenting considerations both pro and con about man and his actions as well as such natural phenomena as frost heaving, water table fluctuations, and ecological succession.

The unit on distribution patterns is relatively brief but contains valuable information. A table characterizing frequent orchid habitats and listing their typical species should prove helpful to anyone interested in exploring for our native orchids.

The long unit on growing orchids provides essential information on methods of cultivation, orchid pests, and obtaining plants for cultivation. It also contains comments on ecological considerations and conservation questions. The list of species especially amenable to cultivation may be helpful for skilled gardeners or trained horticulturists when choosing plants to try in the garden.

Admittedly, the Orchidaceae remain fertile ground for horticultural study. However, it seems only fair to stress that many wildflowers, including orchids, need protection and that amateur gardeners should be discouraged from eliminating them from the few remaining habitats in which they grow. Orchids should be sought with book and camera, not trowel. Those people determined to cultivate orchids should confine their efforts to commercially propagated plants. Case continues to advocate garden cultivation of terrestrial North American orchids. He is prepared for criticism on this point, presenting a list of reasons why it is valid to grow native orchids.

The major portion of the book is devoted to descriptions of the orchid genera and species. Each species discussion includes comments on flowering season, general distribution, habitat, and frequency. The author pays particular attention to the details of habitat. Also included are explanations of the several recent changes in classification and nomenclature (especially in *Spiranthes,* the ladies' tresses), information on variation, citations from the professional literature, references to scientific collections or stations where species have been found, and other miscellaneous notes. Commendably, all species are mapped (one dot in the center of each county), and all are illustrated by fine color photographs—over 140 in all—taken in the field.

The keys are exact enough to satisfy professional botanists, yet can be understood and used by the intelligent layman. They are pictured, that is, accompanied by small but adequate line drawings of flowers of each genus or species with arrows to emphasize the important features for identification. Comprehensive in scope and a joy to read, the taxonomic section makes this volume more than a field guide and different from a manual. The layout and typography contribute to making this a handsome volume.

In short, this is not only an excellent reference that no field naturalist or wildflower gardener in the Great Lakes region can afford to be without, but also a lovely book that should kindle even in botanists with no particular interest in orchids an appreciation for beautiful plants and the dwindling wild places in which they live.

—Theodore S. Cochrane

Omnium-Gatherum

Interest survey—Surveys are still coming in four or five a day as this is being written in mid-February. Enough of the results have been tabulated to show some definite trends. The areas of highest interest to date are plant culture, especially propagation, growing conditions, and hardiness; plants, with the edge to best of genus; where and how plants grow in the wild; new research; and a wanted column. The areas of least interest were computer applications to rock gardening and non-botanical travelogs, though even these have devoted followers. In a few areas such as plant explorers, plant nomenclature, reprints, and single-theme issues, the vote was split with Some Interest receiving half the vote and High and No Interest evenly divided. Those of you who have taken time to write suggestions have added a great deal of interest and value. The results of the survey will be further discussed and implemented in future issues. Thank you, all who have participated. Those who haven't, there is still time, so keep the surveys coming.

Imperfect Bulletins—Those of you who receive *Bulletins* with things gone wrong of a printing nature inside, please let either the secretary or the editor know. If you are prompt, we may be able to send a replacement. Our printer will work to solve problems that arise if he knows what they are, so don't be shy about notifying us of defects.

Pictures—Nothing was mentioned about the pictorial elements of the *Bulletin* in the survey because a high general interest in having good and abundant pictures is assumed and because so much has been written in this column already on the subject. We need to know who has good, sharply focused, well-composed and exposed photographs of interesting plants. It seems to be easier to find a good picture and get an article written to go with it than the other way around. For our color plates we need for each issue to have all of the photos on the same kind of film, either Kodachrome, Ektachrome, or Fuji. We need artists who can supply a variety of line drawings. We need sharp, sharp pictures with good contrast for black and white illustrations. We need a picture editor whose major job will be to seek out artists and photographers and to solicit pictures for the *Bulletin.* Our source of pictures is our membership. Can you help or suggest someone else who can? If you would like a list of plant pictures needed for the summer *Bulletin,* simply request a Summer Picture List from the editor.

Look them in the eye—One of the great joys of gardening, and of life, is being able to see close-up our beautiful plants, but as Evelyn Schule, Pennsburg, Pennsylvania, writes, "If you have a bad knee and wear trifocals, getting down to see some of the little treasures is no joke." To find more joy in her alpines by getting them at eye level, she fills a pottery bowl about 10 or 12 inches in diameter and a few inches high with soil covered by various mosses from the woods and perhaps a tiny rock or two. Five small eyedrop or pill bottles concealed in the moss serve as invisible containers. Flowers are chosen with thought as to height, color, and artistic arrangement. "The one in front of me has white myosotis, two shades of pink and three kinds of yellow primula. There are purple and white *Anemone blanda,* violets, a choice miniature narcissus, and several graceful sprays of yellow epimedium. The anemones were closed when I brought them in, but they cooperated nicely and opened. Earlier in the season I used snowdrops, crocus, *Iris reticulata,* corydalis, and eranthis. A few leaves add interest. Any flower that lasts only one day can easily be replaced. There have been some surprises too. I had never known the fragrance of *Iris danfordiae.*"

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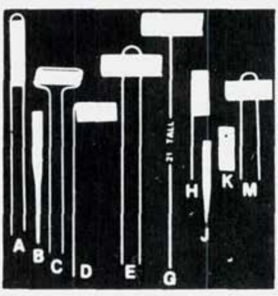

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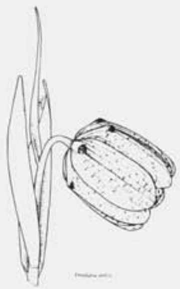

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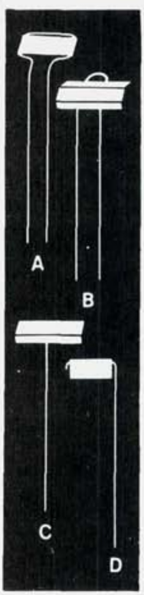

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