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C. R. Worth, Editor

Vol. 18 April, 1960 No. 2

THE ROCKY MOUNTAIN AND GREAT BASIN RANGES

C. R. Worth, *Ithaca, N. Y.*

Sweeping down out of Canada, the Rocky Mountains rise abruptly from the Great Plains — not, as school geographies may have led us to believe, in one vast unbroken wall, but in a great number of short, almost parallel ranges, often separated by wide valleys, but here and there converging into a "knot". Where they begin, and where they end, is a matter of disagreement among the learned: some geologists seem to regard the entire escarpment from Alaska to Cape Horn as a single system; others have proposed that the ranges from Wyoming northward be regarded as distinct from the Colorado ones, and that to the former the appellation "Stony Mountains" be given. This name is, perhaps, the more appropriate one for the entire system, for the Rocky Mountains derive their name not from precipitous crags but from the extensive rock slides that are so prominent a feature of their landscape.

For our purposes it will be most convenient, if not entirely accurate, to regard as the Rocky Mountain system those ranges lying in Montana, Idaho, Wyoming, Colorado, and northern New Mexico, with perhaps some of the mountains of eastern Utah; while those of the Great Basin, whose few streams find no outlet to the oceans, are in Nevada and central and western Utah. The Black Hills of South Dakota, and probably the mountains of eastern Oregon (none of which will be considered here), rightfully belong to the Northern Rockies.

Only in Colorado do the peaks (fifty-one of them) rise above 14,000 ft.; in Montana and Idaho they barely surpass 12,000, but in each of the other states can be found at least one or two summits above 13,000 ft. Timberline varies with exposure as well as with latitude: it is at most around 12,000 ft. in the more southerly and massive ranges, at no more than 11,000 on the more isolated (and consequently drier) peaks, and descends as one travels farther north, until in Montana it may lie well below 9,000 ft.

In composition the ranges vary greatly. Along the "main range", that is, roughly, in the vicinity of the Continental Divide, metamorphic rock seems to predominate, while farther west sedimentary and igneous formations are the

rule. Yet generalization is unsafe, for one may find granitic peaks rising out of a limestone base, at least one granitic range has a limestone summit, and frequently several types of formation lie in close proximity.

Perhaps because the Rocky Mountains are older than the other high ranges of the world and because their northern part was buried under the great glaciers of the last Ice Age, much of the alpine flora is remarkably wide-spread and relatively uniform. *Silene acaulis* extends as far south as northern Arizona; *Primula parryi* occurs from the Front Range of Colorado into eastern Nevada, and from Arizona into (reportedly) southern Montana. Colorado and Montana are perhaps richest and most varied in their alpine plants, while the much drier ranges of the Great Basin have but a limited number of species. Yet it is to these outlying peaks that one must go for some of the choicest plants of the region, and the harvest there, while slim, is vastly rewarding.

The wooded areas have few plants of interest, while the occasional meadow below timberline may provide a considerable number of species of interest to the botanist but of a size and coarseness to dampen the enthusiasm of a gardener. The occasional treeless (or nearly treeless) mountainsides are not to be ignored, for there phlox, townsendia and other delights are often found in abundance.

Especially in Wyoming and Nevada, even more rewarding than the heights to both gardener and botanist are the regions below timber—slopes of hills, canyons, and especially the occasional lime knolls cropping out of an otherwise flat plain. Here are to be found the real treasures of the region, plants as minute, as specialized in growth, and as showy in bloom as those of alpine screes, and in much greater variety: phlox, townsendias, oenotheras, astraguli, minute pentstemons, beckwithias, violas, eriogonums, calochorti, perhaps even *Eritrichium howardii* and *Sphaeralcea caespitosa*. As these flower in spring or early summer, the visitor late in the season may find little but the characteristic "buns" into which many species develop, or sere and seedless fragments of the herbaceous sorts; in a dry year even these may be absent.

With the excellent main highways now general throughout the region, several of which travel for miles near, or even above, timberline, it would seem that the mountains would be much more accessible than they were only a few years ago. Yet, except in a few favored regions, this is not the case, in spite of the speed and ease with which one can now travel from one locality to another. For our modern cars cannot negotiate successfully many of the mountain roads which the Model T and the cars of the 1930's found no obstacle, and many of these roads are in far worse condition than they were a decade ago. It once was a simple matter to obtain horses to carry one where a car could not go; now they are rarely procurable, and one must resort to hikes of many miles through often waterless country, or to jeep travel. Finding an available jeep is often more difficult than renting a horse; even if one can be located, and its iron-nerved owner persuaded to take one on a breath-taking trip to the high places, the cost is usually prohibitive to one of moderate means. Nor can a high-mountain ride in one be recommended to persons affected by awesome slides and precipices along which the road is so narrow that half—or more—of one of the jeep's tires at times has contact with nothing but an apparently bottomless void. Plant-hunting was certainly simpler and far less nerve-racking in the good old days of the 1930's.

In the pages that follow will be discussed briefly some of the regions of the Rockies and Great Basin which I have visited, in some cases many times, over a period of more than twenty years. In writing these notes I have often been appalled, less by the number of ranges about which I know nothing, than by the little I know about those with which I am most familiar. Only by re-

A remote part of Beartooth Ridge at 11,000 ft., in late July. Saxifraga chrysantha *and* S. flagellaris *grow in the turf in the foreground.*

peated visits, season after season, in good years and bad, at frequent intervals throughout the period of growth, can one begin to become acquainted with the plants on a mountain. Even on those where I have been many times, often for extended visits, I still discover plants of real interest which I had never noted in the past. Yet many of our mountains have been visited only once or twice by botanists and collectors, and some are perhaps still virgin territory. While there is probably little likelihood of finding many new species, especially at high altitudes, in regions still but sketchily explored, range extensions and notably good (as well as more adaptable) forms are likely to be encountered almost anywhere. Our western mountains are still a worthy hunting-ground for the adventurous collector!

MONTANA

For reasons that I cannot fathom, the mountains of Idaho and Montana have appealed to me far less than the more southerly ones, and I am shamefully ignorant of most of these two states. Yet their rich flora is still incompletely known, with vast areas totally unexplored. Indeed there are great blanks in the knowledge of even the most accessible regions. After being informed by an excellent taxonomist that a certain species was unknown in the locality in which he lived, I brought in some specimens to him which I found less than five miles away, spotted while driving along a transcontinental highway, on a cliff barely twenty-five feet from the road.

The most readily available alpine region in Montana, and one of the most rewarding, has often been praised in the *Bulletin:* Beartooth Ridge, crossed by the highway from Red Lodge, Montana, to the Silver Gate entrance to Yellowstone Park. One is above timberline for many miles, but only on the

highest part of the ridge, at about 11,000 ft., and on Beartooth Butte, a limestone outcrop back of Beartooth Lake, is the flora really exciting. Here, within a few feet of the highway, in mid to late July, one will find a remarkably extensive cross-section of the plants of the northern Rockies. A trip on foot along the summit ridge will reveal a number of rarities, among them *Saxifraga chrysantha,* which seem limited to a very small area.

To the west of this, the mountains behind Pony, where Rydberg collected, display most of the Beartooth species, and a few others, including one of the few really choice lupines, and the only *Cassiope mertensiana* I have ever met. But this country becomes progressively less accessible: the first time we visited it we drove almost to the alpine zone, the last it was necessary to hike in some ten miles over a gullied road that not even a jeep could have negotiated.

East of the main ranges, the "mountains of the plains" rise up abruptly here and there: the Crazy, Judith, Little Rocky, Snowy, Castle, Little Belt, and Highwood Mountains. Timberline is low in these ranges, and the flora often extensive and precious, including, for those who know where to seek them, *Eritrichium howardii, Aquilegia jonesii* and an especially good and adaptable form of *Douglasia montana.* Botanists seem to have ventured rarely into this territory, and delightful surprises are to be anticipated. Low Mt. Helena, just outside the city limits, has a remarkable variety of plants, including a rare (but far from scarce) phlox. *Kelseya uniflora* is at home on lime cliffs above the Missouri River a few miles to the north.

IDAHO

My first experience at high altitudes was in the Sawtooth Range, about fifty miles north of what is now Sun Valley. On the grim jagged peaks, inhospitable to plant life, I can recall little other than *Penstemon montanus, Polemonium viscosum,* a rather good ranunculus and a creeping epilobium. Mountain meadows were more productive of choice miniatures, including what I recall as *Oreastrum haydeni* and *Eriogonum ovalifolium,* but offered nothing so rare that a return visit was indicated.

Likewise, an exhausting climb up the steep slopes of Mackay Peak, rising above the arid Lost River valley, revealed nothing more exciting than *Eritrichium elongatum* and *Petrophytum caespitosum* (normally a lowland plant) growing happily together. An arnica, *Erigeron compositus,* a couple of fair-sized but attractively colored eriogonums, and starved specimens of *Penstemon montanus* were also noted. The scenery was magnificent. The Lost River Range, to the eastward, looks even less tempting to the plant hunter, although at its base is one of the few homes of *Kelseya uniflora.*

Most of the mountainous part of Idaho is still unknown botanically, and is perhaps worth exploration by the adventurous collector; but the peaks which I have seen are not of the type that shelters a rich flora, and have not aroused in me any urge for further investigation, at least until I weary of less inaccessible territory.

The valleys seem to offer another story: not a great variety, perhaps, but some most attractive species, at least a few of which are apparently local endemics. Perhaps roadside exploration will prove much more rewarding than arduous climbs.

WYOMING

The traveller coming from the east on U. S. 30 meets his first mountains in the low and ancient ridge of the Laramie Range lying between Cheyenne and Laramie. The gentle road cannot alarm the most cautious driver, and offers

plenty of opportunity to stop and reconnoiter along the way. In a good season the eastern slope is rich with a wide variety of showy plants, among which several species of Penstemon and Oxytropis will first entrance the eye. It is rumored that in early spring the summit is blue with rare and local *Mertensia humilis,* of which I have never been able to find a trace in summer. This species is entirely unknown in cultivation, but apparently it is a real gem. I beg anyone meeting it to send me a few plants for trial. Elsewhere, among the crags to the north of the highway, *Polemonium mellitum,* a lovely and cultivable plant with long creamy trumpets, may sometimes be found in profusion. Not so *Aquilegia laramiensis,* coarser in leaf than *A. saximontana* but with cream flowers of the same size: its lone stand in the region was, when I last visited it, reduced to a single plant growing in an inaccessible crevice.

The western slope is more heavily wooded and not noteworthy for plants until one reaches the mouth of the canyon, where *Penstemon exilifolius* and a few other species are of interest. Houses now cover the area where some twenty years ago I found what was then known as *Phlox glabrata;* I have not seen it elsewhere.

Westward from Laramie, Wyoming 130 leads directly to the heart of the Snowy Range of the Medicine Bow, but the traveler should not have his eye so set on the snow-capped peaks that he fails to watch the roadside, for, starting only a few miles west of the city, every outcrop of white limestone has its own collection of exquisite miniatures—phlox, townsendia, lesquerella, penstemon, strange astraguli and oxytropis among them. The thirty miles to the base of the mountains will take a long time if one stops to examine every fascinating colony.

At Centennial, just before the road starts to climb, another pause is imperative, for the sunny hillside to the right of the road has its own generous share of plants not met before: two phlox, penstemons, castillejas and many other species, apparently varying somewhat from one year to the next. No further stop is likely to prove fruitful until one reaches the heights; but as soon as the trees stop, it is time to pull off the road and to shout with joy—unless one arrives after sheep have grazed off almost everything. It is futile to mention all the plants that may be expected here, and none is of outstanding rarity, but surely *Polemonium viscosum, Eritrichium argenteum, Phacelia sericea, Mertensia bakeri, Phlox caespitosa* var. *pulvinata, Gentiana elegans, Elephantella groenlandica, Erythronium parviflorum* and some exquisite erigerons and asters are enough to make any alpine gardener happy. The road ascends, always by gentle grades, and with only one switchback (just after leaving Centennial) to 10,800 ft., but plants at the summit are less varied and interesting than those a few hundred feet lower down. The mountains rising above (Medicine Bow Peak is just over 12,000 ft.) are barren looking and not too easily accessible. They can have few plants not already found, yet some day I hope to investigate them more thoroughly. The road down the western slope is an anticlimax, passing through heavily wooded territory, although the open slopes at the foot are reported to have their share of interesting plants early in the season. Turning northward, Wyoming 130 passes through some of the most barren and windswept country I have ever visited, yet the keen eye may discover the fascinating buns of *Astragulus tridactylicus* close to the road.

Northward from Rawlins, U. S. 287 offers the most direct route to Yellowstone Park. The country is far from plantless, although little can be seen from a car. Careful checks from time to time may bring to light two rare penstemons and several interesting mat-formers. Along the Sweetwater River, the roadbanks are covered with phlox and oxytropis, so that many other species should be found in a less dry season than that of 1958. Beyond Lander, the Wind River

Valley, in its upper reaches, has strikingly original forms of rather familiar plants. Togwotee Pass had nothing exciting to offer when I once visited it briefly.

If, when one meets the Sweetwater, one turns eastward to Casper, along the emigrant route, the roadsides are almost barren, at least in a dry season. West from Kaycee a road, dirt except for the first few miles, leads to the brilliantly red Hole-in-the-Wall country. Between it and Outlaw Canyon, even in the desperate drought of 1959, could be discerned the vestiges of a considerable number of interesting miniatures, most of them unrecognizable, although phlox were in profusion. This region seems to merit thorough exploration in May or June of a favorable season.

The Big Horns, isolated in north-central Wyoming, are crossed by two main highways which climb above timberline, yet their high peaks (Cloud Peak attains 13,165 ft.) are in a wilderness area accessible only on foot or horse. The summits appear to be of metamorphic rock, inhospitable to plants, but the lower regions are of greater interest to the collector. U. S. Route 16, westward from Buffalo, offers no difficulty to those inexperienced in mountain driving, with the exception of a few switchbacks at the western end which are being eliminated by new construction almost completed in 1959. Powder River Pass, the 9,666 ft. summit of the road, is surrounded by extensive alpine meadows. My two visits there have been in dry seasons, the second after the slopes had been sheeped, so that there are perhaps many species which I have not seen. Among these is tiny *Mertensia oreophila,* a most precious local endemic. *Eritrichium elongatum* is one of the plants that grow within a few feet of the parking place at the pass.

U. S. 14, which goes west from Sheridan, crosses the range considerably to the north of the high peaks. In spite of the habit of AAA and certain gas companies of routing tourists over this highway, it is by no means to be recommended to nervous drivers, or for cars pulling trailers; even residents of the region are unenthusiastic about the switchbacks on the western slopes. The eastern approach (being rebuilt in 1959) is not as bad, although there are a few rather alarming switchbacks. Just before reaching Bear Lodge, the plant hunter should leave U. S. 14 for Wyoming 14. After a few miles, the wooded plateau abruptly gives way to rolling treeless meadows where, I am told, snowstorms and even deep snow on the highway may be encountered at any time of summer. Our stay here was all too brief, and I could no more than sample the amazingly rich alpine flora at two or three places: phlox, minute astragulads, *Townsendia parryi,* drabas, eritrichium, prostrate willows, *Douglasia biflora, Dodecatheon uniflorum* (?) only two inches high, *Hymenoxys acaulis* var. *arizonica* (seed distributed as Haplopappus sp.) *Ipomopsis* (*Gilia*) *spicata, Boykinia heucheriformis* (deep red flowers, by no means a bad thing, in spite of the sneers with which it is usually mentioned), oreastrum, erigerons (including the best form of *E. compositus* which I have ever seen), even, for the keen-eyed, *Aquilegia jonesii.*

The delights of the Big Horns are not merely at alpine elevations, for the region around Story, especially Tunnel Hill, is full of attractive plants. To the south of Buffalo, *Penstemon glaber, P. eriantherus, P. nitidus* grow along the highway. The pastures of Vere Duncan's ranch have their quota of miniatures (all burned to a crisp last summer). High on the limestone cliffs of Crazy Woman Canyon, distinguishable with difficulty from the more profuse *Petrophytum caespitosum,* grows *Kelseya uniflora* with tiny stars of wild-rose pink, safe from all but the most intrepid rock-climber.

A medium-sized plant of Kelseya uniflora, *related to the spiraeas. This specimen, about eighteen inches across, is apparently well over fifty years old.*

Yellowstone Park is best left to the tourists and the bears for even if collecting were not prohibited (as it is in all the national parks), along its main roads few plants of interest are to be seen, and even those usually in poorer condition than elsewhere. On Electric Peak in the northwestern corner of the park (actually over the state line in Montana), inaccessible except by pack trip, early in the century P.A. Rydberg found a number of rare alpines, as he did also on Hoodoo Peak, along the eastern boundary of the park. The rugged Absarokas to the east seem little explored botanically; a stay at one of the dude ranches near Cody might be profitable florally, for on the Needle, in the 1870's, was collected a most remarkable townsendia that seems never to have been found elsewhere.

Just south of Yellowstone the jagged peaks of the Tetons, most spectacular of our American mountains (recall the backgrounds of the movie "Shane"), seem to feel that their beauty relieves them of the duty to display notable plants. True, *Primula parryi* grows there in quantity (the most northerly station where I have found it), *Caltha leptosepala* is in a very good form, eritrichium and *Silene acaulis* are occasionally seen, and the lower canyons are brilliant with fairly common herbaceous things, but one may enjoy these elsewhere without running afoul of the rangers.

Indeed one need go no farther south than Teton Pass, west of Jackson, to encounter a floral display the like of which, Kathleen Marriage told me, she had never seen in Colorado. The climb to the summit to the north is far more taxing than it appears to be, but florally it is worth the effort. After leaving behind the blue flax, scarlet gilia, and other huskies, one comes upon an especially fine white phlox, *Townsendia montana* in violet (in Utah it is white or pink-flushed, and more compact), a remarkable physaria (very scarce), really marvellous erigerons, *Penstemon montanus,* and *Synthyris paysoni.*

Across Jackson Hole, Sheep Mountain (glimpsed once in "Shane") has a variety of plants which I have not found elsewhere in the region, including the red boykinia (if it actually is *B. heucheriformis,* here it is as good as the much advertised *B. jamesii*), *Gentiana calycosa* (?), and *Salix dodgeana*—"the smallest willow in the world", but far less attractive than the prostrate mats of *S. retusa* and its kin.

South of Jackson, the rugged Gros Ventre Range looks like a poor home for plants, but a woman who had just returned from a pack trip there told of a wealth of beautiful alpines, so that a venture among those wild cliffs might well be a profitable gamble. Beyond this range, the wild Wind Rivers terminate the Northern Rockies—a region still little known, from which I have never seen a plant record. In the 1930's Harold G. Rugg made a pack trip into them with (as I recall) the Appalachian Club. Keen plantsman that he was, he reported to me nothing more excitingly novel than *Primula parryi,* which leads me to suspect that the Wind Rivers are by no means a "plant hunter's paradise". There are dude pack trips into them available to the venturesome at relatively low cost; such a trip should be a scenically exciting, if not a florally rewarding, experience.

Near the Wyoming-Idaho border, west of Big Piney, is a small range that seems to be nameless. Access is somewhat difficult, for after a shower the dirt road becomes a bottomless bog, while a modern car can barely negotiate the last few miles. Unfortunately, the dude ranch from which I used to go in to the peaks on horseback is no longer in operation. Among the limestone mountains seems to be the meeting-place of the northern and southern floras, not in great profusion, but in endless variety. Here *Primula parryi,* eritrichium, *Townsendia parryi* and *T. montana* become commonplaces. One marvels at a draba which at first is mistaken for eritrichium, at *Oenothera caespitosa* on a red shale ridge *above* eritrichium, at incredible mats of *Collomia debilis* with glowing wine trumpets, at *Penstemon montanus* in its best form, at the dazzling beauty of prostrate yellow-flowered *Linum sedoides.* Alas, on my most recent visit there, great slides had robbed the slopes of some of their treasures, the climbs seemed far longer and more exhausting than they had twenty years before, and the road vastly more perilous. Perhaps that visit will be my last.

The excellent road between Lander and Rock Springs across South Pass, route of the emigrant trains, I have followed only once, in an incredibly dry year—and then had activities hampered by a heavy shower. The elevation is not great, but the scraps of plants which we found (including great sheets of phlox, but these are commonplace in western Wyoming), together with a brief report by Ripley and Barneby, suggest that in early summer the area should be rich with the more desirable plants of subalpine meadows.

UTAH

Utah, with its friendly people, spectacular scenery, marvellous and fairly accessible mountains, and superlatively interesting flora, has long been my favorite western state, although of late years Wyoming and Nevada have become its rivals. One who has crossed it only by rail or highway, or visited only Salt Lake City and the national parks, knows nothing of the real Utah: for that one must venture off the tourist routes, stay in the villages, camp in the mountains, visit the vividly colored uranium country on the East Desert.

The Uintas, in the extreme northeastern part of the state, are its highest and least accessible mountains, and the only range in the Rockies with an east-west axis. I have crossed their eastern part only once: in the past two sum-

Lewisia rediviva *hiding beneath sagebrush in the Wind River valley in mid-July.*

mers the rather poor road was being rebuilt, the region blasted with drought, so that to visit them would have been difficult and profitless. The Uinta Basin was thoroughly botanized, in the 1930's, by Edward Graham, so that the flora of their high peaks is no mystery. Their only noteworthy endemic is *Parrya platycarpa,* and there seem to be no other special rarities, nothing to tempt the collector when more intriguing ranges are near at hand. The lower elevations of the Basin, difficult of access, do boast a number of endemics worthy of introduction.

Almost on the Colorado border, in the central part of the state rise the still growing LaSals, three groups of peaks, the central one over 13,000 ft.—next to the Tetons perhaps the most beautiful range I have seen, set on a series of ascending mesas above the red cliffs of the Colorado River. There is a road girdling them, and another through their heart, but these are for jeeps only. I have visited only two peaks of the northern group, and have found the plants there few and disappointing, strays from Colorado: *Claytonia megarrhiza, Polemonium viscosum, Lychnis apetala, Gentiana parryi* (?), a strange tiny castilleja with brown bracts, and little more.

In a box canyon along the Colorado grows, clinging to wet sandstone cliffs, *Primula specuicola,* like a giant and rather narrow leaved *P. frondosa.* Twice in the past I have sent back seed, yet nothing seems to have come of it, even in England. Perhaps the 1959 collection will be more successful. With it grows, often in great banks, *Aquilegia micrantha,* from one foot to three in height

with smallish long-spurred flowers that are predominantly white or pale yellow, but vary rarely to blue or even brilliant red. Each of these color forms has been given a specific name, fortunately no longer valid. High up out of reach on the cliffs we saw a single mat of *Mimulus eastwoodiae,* whose long tubular scarlet and yellow flowers, with flaring lip, suggest a columnea strayed far from Panama. Pennell claimed it to be merely a form of *M. lewisii,* but for garden purposes it is completely distinct and far more desirable—and so far has resisted introduction. It has been reported also from the vicinity of Rainbow Bridge, far to the south, and is profuse along the cliffs of the San Juan River, where it flowers in latest summer. One suspects that both it and the primula may be of frequent occurrence in the canyons of the Colorado, for the latter reappears on the Weeping Rock in Zion Canyon, protected forever from the tourist hordes that gaze on it, ignorant of the rarity before them.

Farther south, a few miles west of Monticello, rise the 11,000 ft. Blue Mountains (Abajo Mts. on most maps). Three times, being in the vicinity, I have wandered into them, without ever finding a plant worthy of my effort; the fourth, I passed them by. Several rarish penstemons which used to grow near Monticello seem to have become the victims of "progress".

The road from Blanding west to the Arches National Monument formerly passed through incredibly beautiful and spectacular red rock formations; near Bear's Ears, just before a precipitous plunge to the Arches, grew unique *Penstemon lentus albiflorus* and the exquisite lavender mats of *P. xylus.* The road was really bad, almost a roller-coaster ride at times, and has been replaced, at least in part, by a new one not shown on maps available last summer. Whether eventually it joins the old one I did not ascertain, but hope that the penstemons are now safely remote from the grasping hands of tourists.

Far to the west, across the canyons of the Colorado, and only a stone's throw from Robbers' Roost, rises the huge bulk of the three groups of the Henry Mountains, visible from almost anywhere in southeastern Utah on a clear day. Described to me by a rancher as "ledgy" and full of rattlesnakes, and botanized by both Jones and Stanton without any sensational discoveries, the 11,000 ft. peaks probably do not merit the long drive over a primitive road.

The great range—really a series of ranges of quite distinct geological history—of the Wasatch extends southward from near Ogden to west of St. George, through almost the entire length of the state. Of the high peaks behind Salt Lake City I have had no experience. They seem to have been explored quite thoroughly by local botanists; so too has Timpanogos, "the Sleeping Princess", giant of the range, directly behind Provo. I have returned there several times, although I assure myself that each visit will be my last. One approaches the 12,000 ft. monster by driving up Provo Canyon for some miles, turning left at the Skyline Drive (along its sharp curves the road is tilted at most intriguing angles, giving one the sensation of being about to slide over the brink into the Hereafter), and parking the car just before the road doubles back sharply to ascend a steep hill. Striking off through the woods to the left for a few hundred feet, one comes upon a wide trail which eventually leads to the summit. Eventually is the right word, for the long trail is strewn with smooth small stones on which one slides and turns one's ankle, makes intolerably lengthy switchbacks, and has one completely exhausted and exasperated before the first slides are reached. The little stream that tumbles over a long series of cascades is annoyingly inaccessible, the canyon hot and thirst-provoking. On most of my visits the canyon has stunk of sheep and everything of interest has been grazed off to a considerable altitude. Last year no sheep had been in, and plants were visible whose existence I had never suspected. *Aquilegia flave-*

scens, Scrophularia occidentalis, Mahonia repens (or is the little creeper currently under another name?) *Penstemon cyananthus, sepalulus,* and parnassia are common on the lower slopes where not choked out by vicious stinging nettles (at least on earlier visits the sheep had kept *them* down). Higher up, *Penstemon humilis* ssp. *brevifolius* makes minute tufts on lime outcrops, and nearby *P. leonardii* out of bloom suggests a minute *P. bridgesii.* The first slides have little of interest, but on the next are *P. montanus* and *Collomia debilis,* neither in as good form as in Wyoming. A delicate trailing clematis (? *Atragene pseudoalpina*) and a tall and nearly decumbent viorna vie with raspberries, with here and there the fern-like leaves and head of lavendar-washed tubes of *Chaenactis douglasii.* It is not on the slides (though occasionally along their edges) that the interesting plants appear: *Primula parryi,* a delicate arnica (I hope), tallish mertensias, an assortment of castillejas, *Synthyris pinnatifida* scarce on one shaded lime cliff, a caespitose white phlox whose seedlings find our eastern summers tolerable. Many other plants are reported from the final ridge which, for one reason or other, I have never attained.

About fifty miles to the south, just east of the highway, lonely Mt. Nebo seems never to have been botanized, except at its lower levels. Although its knife-edge summit and long barren rock slides are grim and uninviting, they have long intrigued me—in vain, for every effort I have made to obtain a horse and ride to those formidable heights has come to naught.

Farther south, and eastward, lies the long ridge which I have described in "The Mountain" (*Bulletin of the Alpine Garden Society,* September, 1959). Traversing most of its length, largely at subalpine elevations, is the Skyline Drive, built in the late 1930's by the CCC and at present in rather poor condition. It may be entered from U. S. 6-50 at Tucker, or from many points in the valley west of it. It is a trip for the venturesome only, and in few places is it florally worth while, yet there are miles of subalpine meadows that in late June or early July (often while the road is still under snowdrifts ten or fifteen feet deep) are covered with varied bloom. One of its summits harbors the type station of *Aquilegia scopulorum* (poorest in color of all the forms of this variable species), *Silene petersoni, Townsendia montana, Lesquerella hemiphysaria, Synthyris laciniata, Gentiana barbellata, Haploppapus clementis* (?), *Polemonium viscosum,* a densely caespitose phlox with grey-green foliage and pure white flowers (seeds were offered in the last Seed Exchange list), and a little zygadenus with sizeable creamy stars—and of course composites in endless variety.

Yet farther down lie the "Golden Peaks" which I described in these pages several years ago. They are discreetly hidden from the road, and I shall not reveal their exact location. For last summer I learned that they have suffered the supreme desecration of having a jeep road built over the very spot to which I used to struggle on foot or horse for an especially fine form of *Aquilegia scopulorum* (the one in general cultivation—if the progeny in gardens are still true). Yet the jeep trip there is so hazardous and nerve-racking that perhaps some day I shall lift the veil of secrecy, in the hope that anyone who can survive the journey without being reduced to jittering idiocy may be worthy of meeting my best-beloved alpine.

At a sheep camp on 11,000 ft. Boulder Mountain, northeast of Bryce Canyon, I once spent nearly a week in vain search for the almost legendary *Penstemon parvus.* Never have I been in a region so dreary as this vast gently sloping summit: patches of dying timber intersecting boulder-covered meadows so heavily grazed that scarcely an interesting plant could be found. Each place looked the same as the next; the "ducks"—rocks piled up to mark the trail—could scarcely be distinguished from the surrounding boulder fields. The sun

rarely shone, and for the only time in my life I was lost as soon as I went out of sight of the camp.

The road to Bryce Canyon, most exquisitely beautiful of all our national parks, leads through scarcely less marvellous Red Canyon. On its steep slides of red limestone is a fascinating array of miniatures, in part descended from alpine levels, though others seem to be local endemics. Many of the plants are far from easy to find, even on a second visit, although dry seasons have increased the difficulty. *Aquilegia scopulorum* var. *calcarea,* its soft blue leaves and dark flowers in violent contrast to the red background, seems confined to a single slope. Hours of search revealed only three or four plants of minute *Penstemon calcareus,* unfortunately seedless. The deep side canyons must be worth detailed exploration in a normal year, for there are frequent abrupt changes in the flora. As one approaches the entrance to Bryce Canyon, sharp watch should be kept for the tall blue spikes of *Penstemon brycensis* Pennell ined.

Tantalizing are the low ranges of the West Desert which one crosses on Utah 21, between Milford and the Nevada line. Still almost unknown to all but the herders who winter their sheep in the broad flat valleys, they have produced such fascinating (and difficult) plants as *Penstemon concinnus, P. nanus* and *Sphaeralcea caespitosa;* their summits are sheeted with phlox and with corpses of other plants unknown to me. The great problem is how, in this waterless and almost uninhabited region, one may venture far enough from the nearly deserted highway to discover what lies in the heart of the San Franciscos and Wah Wahs.

The Pine Valley Mountains, in the extreme southwestern corner of the state, and the 12,000 ft. Deep Creek Range, near the Nevada line almost due west of Provo, as well as the ranges along the northern border, remain unknown to me. There are indications that they may be good hunting grounds.

Roadside collecting, except in narrow canyons and at high altitudes, is usually futile in Utah. A century of overgrazing has left hillsides and valleys denuded, and rarely can one find a choice plant at a station from which it was reported fifty or more years ago.

NEVADA

Last of the western states with which I became acquainted, Nevada is perhaps the most fascinating of all. Because of the extremely limited water supply, the original flora seems to have been little disturbed, except in a few localities, by grazing. Surprises are frequent: lofty peaks which seem never to have been visited by botanists, bursts of bloom in apparently barren valleys, delightful miniatures on lime outcrops in regions so arid that plant life seems impossible. To venture far off the main highways is difficult and often hazardous in this sparsely inhabited country of intense drought and blazing sun. Yet some plants from the most austere deserts have prospered in England and have made their appearance at shows there; it may be that the plants linger on as relics of a wetter age, and that they would infinitely prefer a more comfortable way of life.

From Las Vegas it is barely an hour's drive over a magnificent road to Charleston Park at about 8000 ft. in the Spring Mountains, where food and lodging (with cost far in excess of quality) may be obtained. Above the valley tower sheer cliffs rising to 11,910 ft. Charleston Peak, apparently impregnable. Yet a trail winds upward, steep and exhausting, through sheerly sloping woodland and over vast slides and screes, traversing the summit and going on and

Townsendia montana *in lime scree above the Horseshoe, central Wasatch Mountains, in early July.*

on for some twenty miles, often on narrow ledges above appalling abysses. There are no surprises for the plant-hunter, for the entire range was botanized exhaustively (and over-zealously, perhaps) by Clokey some years ago. Plants are limited in variety and often in number. In the last woodland grow the neat little tufts and rich blue trumpets of *Penstemon keckii* and the tiny mats of *P. thompsoniae.* At first on the high ridge one encounters little but a tiny and attractive erigeron and the great *Primula parryi*-like tufts of *Dodecatheon jeffreyi* var. *redolens* in locations that seem far too parched for it. On the screes, which seem to stretch on endlessly, and over which one labors for hours in vain hope of finding something different, are the erigeron, silver lace mats of the apparently scarce endemic *Tanacetum compactum,* two utterly fantastic little astragulads, and *Aquilegia scopulorum*—almost nothing else except innumerable clumps of the dodecatheon: delightful fare, but after all the exertion of the climb, one would appreciate a more varied one. Lower down, especially near the mountain road between Lee and Kyle Canyons, may be found many interesting and unfamiliar small plants, among them *Aquilegia shockleyi, Oeonothera caespitosa* var. *marginata* (a plant or two of var. *crinita* may appear at high altitudes), and minute *Synthyris ranunculina.*

Of the mountains in the western part of the state lying east of the Sierra Nevada, I have visited only the Wassuk Range above Hawthorne. As Amel Priest and I approached the mountains in early morning, I was dumfounded and ecstatic, for rarely have I seen such vast alpine meadows above the last aspen. When we had obtained permission to enter the Naval Reservation and had coaxed the pickup up a corkscrew road, there stretched for miles and miles —sagebrush and nothing but sagebrush. Only a few plants of *Penstemon specio-*

sus and something dullish—an aster, perhaps—were the other inhabitants of those "alpine" meadows. Never have other mountains so insulted me.

Perhaps because of this rebuff, I had, the next day, little enthusiasm for the great Toyabe Range in the central part of the state. Enough to see that the "pygmy forests" of which I had heard were—you guessed it. A ranger had told me that the summits were sagebrush-covered, but I had hopefully assumed that he did not know his plants, for there are minute species of artemesia in alpine meadows elsewhere. I rebelled at the mere thought of the twelve mile hike to the summit of 11,775 ft. Arc Dome, and even at the ascent of isolated Bunker Hill, although it is a reported station, perhaps the most westerly, of variable *Aquilegia scopulorum*. Perhaps I do the Toyabes an injustice, for their well-watered canyons have sheets of several penstemons and of what I took to be *Gentiana elegans*, while a rare and desirable mertensia has its habitat at their northern end. But I believe that I shall remain content to explore elsewhere. The high range a few miles to the east of the Toyabes looks even less inviting.

Around Austin, and all along U. S. 50 to the east as far as Ely, lime outcrops in what must be one of the most arid parts of our country display some of the strangest of plants—the dense domes of *Phlox tumulosa* and of the utterly incredible crucifer *Lepidum nanum*, penstemons only a couple of inches high (one wonders whether the flowers engulf the plant). Between Eureka and Ely, notably (according to Dwight Ripley, for we visited it too late in the season) at Pancake Summit, are to be found a variety of xerophytic treasures which have, inexplicably, proved tolerant of British gardens. The wooded slopes a few miles west of Ely displayed a few interesting plants, even at the unfavorable time when I visited them.

But it is at Ely that the fun really begins. The hills at the west edge of town have no less than eight penstemons—*PP. bridgesii, eatonii* ssp. *lancifolius, humilis, miser, dolius, palmeri, pachyphyllus* ssp. *congestus, deustus*—three phlox, *Petrophytum elatius*, two astragulads (one of these white-woolly in leaf and pod), at least one calochortus, *Oenothera caespitosa* and *O. c.* ssp. *crinita*, argemone—all these and other plants in late August, when many kinds are completely dormant. The hills and canyons both north and south of the city have been less exciting, and it seems questionable that they are the homes of too many species that do not appear near town, but they deserve exploration earlier in the season.

A few miles to the southwest, the great ridge of Ward Mountain presents a challenge and a test of endurance to the plant hunter, as does Duckwater Peak, 11,493 ft., not far from the highway north of Currant. While there has been some collecting done on the former, the latter seems still untouched, and the great cirque on its north face, sometimes with snow at low altitudes in mid-August, may harbor several interesting surprises. Drought in the summer of 1959 made postponement of explorations advisable.

Beyond Currant, the ranch of my friend James Sharp lies at the foot of low and apparently inaccessible Blue Eagle Peak; near its base, even at the edge of great alkali flats, are a few meritorious plants. Some miles to the south rises 11,268 ft. Troy Peak, topped on its west by sheer limestone cliffs. Three times Jim and I have struggled up its incredibly steep slopes, accompanied once by Amel Priest and another time by Jim Koenemann, who went far up on the cliffs but, because of the difficulties of the descent, brought back no plants. On the cliffs grows a minute primula of section Parryi, which Sir William Wright-Smith declined to name, although an American taxonomist is of the opinion that

it is *P. maguirei,* otherwise known only from Logan Canyon in extreme northeastern Utah. From my necessarily scanty collection (even the inaccessible plants are a few in number), this gem has been flowered at Rochester and in England. With it grow what must be the tiniest of all erigerons, *E. uncialis* var. *conjugens,* which develops a few inch-wide rosettes from a woody base and bears half-inch daisies on stems of the same height—pink in the mountains, but seedlings in England have flowered white. There are also another erigeron, an eriogonum of the clan of *E. ovalifolium,* a fern, and a few other plants, all in very limited quantity, and all still undetermined. Only rarely does one of these seed down from the cliffs to the extremely steep screes at their base. Lower down, in the depths of sheer Troy Canyon, grows a remarkable foot-high columbine with long-spurred flowers of intense blue or vivid red, but regrettably paler in cultivation. Although, except for the flowers, it bears not the slightest resemblance to any *A. scopulorum* which I have ever seen, Dr. Munz is of the opinion that it is either an extreme form of this species, or a hybrid between it and *A. shockleyi,* which grows much farther down the canyon, along with *Dodecatheon jeffreyi.* There are also some delightful stinging nettles of unusual potency, as I found out when I slipped on a steep descent.

Of the Shell Creek Range and the intriguing peaks to the north of Ely I have no knowledge, but later will appear an account of a visit to the Snake Range, site of a proposed national park.

ARIZONA

Of all the Arizona mountains, only the volcanic cone of the San Francisco Peaks just north of Flagstaff rises above timberline, some 13,000 ft. A few years ago, and perhaps even now, a toll road climbed to the very rim of the crater, but for the plant-hunter, the trip was not worth the effort. On the cinder slopes I could find only *Polemonium lemmonii* (a depauperate *P. viscosum* but two inches high), *Silene acaulis,* and a white-flowered thlaspi. At the base of the cinders *Primula parryi,* although the season was extremely dry, grew thirty inches high, and there were a few other plants of very minor interest. In the woods around the base of the peak are many larger, but attractive plants, among them *Lithospermum multiflorum,* while on the road to Sunset Crater is the only home of *Penstemon clutei,* and exquisite *P. linarioides compactifolius* occurs near the cliff-dwellings of Walnut Canyon. The road eastward along the Grand Canyon has some interesting localities, while early spring visitors to the north rim should be alert for rare and untried little *Mertensia macdougalii. Primula hunnewellii,* vaguely reported from somewhere in the Grand Canyon, is perhaps no more than a "split" from *P. specuicola.*

In the extreme southeastern part of the state, the woody plants of the Chiricahuas are distinct and novel, belonging largely to the Mexican flora. There Priest and I were unable to find either *Primula rusbyi* or *Penstemon pinifolius* at their reported stations, while the Huachucas, where they also occur, had been blasted by three rainless years.

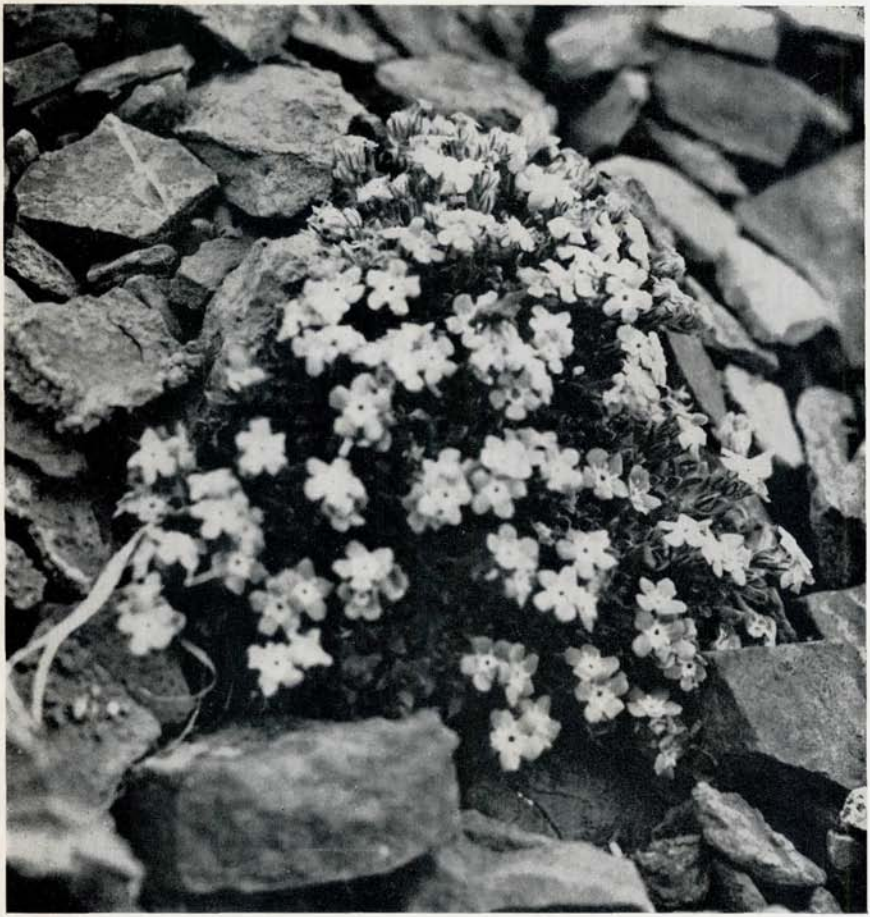
While the lowland flora of Arizona is rich and varied, summer is not the time to see it. Apparently most plants bloom in late winter or early spring, and except for the relatively uninteresting mountain plants, there is little to see in midsummer.

NEW MEXICO

The lowland plants of this state, where the altitude is generally much higher than that of Arizona, usually come into flower in summer, after the rains have begun, so that the traveller across the desert regions is likely to come upon patches, here and there, of brilliant bloom, largely that of small annuals. In spite of their southern habitat, plants from New Mexico seem remarkably at home in northern climates: *Primula ellisiae* is perhaps the easiest of its perverse section, while *Penstemon pinifolius* is happy almost everywhere from Scotland to the Pacific Northwest.

The rather low and extremely arid ranges of the southern part of the state have a limited flora which is closely akin to that of northern Mexico, according to the regional floras; I have had little opportunity to explore them. The Organ Mountains, a few miles east of Las Cruces, have a quite distinctive apparently endemic flora, but when I was last there this whole region had been closed to travellers (other than on the main highway) by the military. A two week visit to the Mogollon Range, in the west-central part of the state, was disappointing in the extreme: the only plant of real interest seen there, even on a long pack trip, was *Polemonium flavum*. There was no trace of *Penstemon pinifolius,* which some years later Priest and I introduced from the mountains near Magdalena, farther east. Northeast of Silver City lie the type stations of several valuable species, among them that of *Phlox mesoleuca,* although the plant grown under this name seems to have been introduced from Texas, and a botanist told me that he could find nothing resembling this plant at its type locality. Here is a conundrum on which Dr. Wherry can perhaps enlighten us. My acquaintance with the region has been slight and unrewarding.

The most interesting of the New Mexican mountains is, to me, Sierra Blanca, which lies just east of the White Sands. The 12,000 ft. summit can be visited on a long day's horseback trip from the resort village of Ruidoso on the eastern slopes, but there will be little time for collecting on the way. Two pack trips which I have made to the peak have been enjoyable and rewarding, although the western side of the mountain is barren and dull. *Silene laciniata,* in a form hardy (though not easy) in New York, lifts its flaming jagged suns in light woodland. One meets *Oenothera taraxacoides,* like an overgrown *O. flava,* with yellow flowers larger than those of *O. caespitosa;* dense thickets of *Lupinus sierrae-blancae* and the delphineum of the same name, both fully five feet high, the latter with brown flowers; *Iris missouriensis* (according to Wooten and Standley) sheeting open mountainsides with a wide range of color variants; *Erysimum wheeleri* with flowers changing from yellow through brown to purple, but here, alas, tall and gawky. As one approaches the final screes the flowers become more alpine in nature, and include a striking monks-hood well under a foot in height, which seems to be no more than a dwarf form of wide-spread *Aconitum columbianum.* The wind-swept screes are clothed with acres of *Primula ellisiae,* with little—and only moderately interesting—*Potentilla sierraeblancae,* and with an unbelievably dull besseya whose name I have for-gotten, but which I had the somewhat dubious honor of being the first to collect in flower. On the cliffs below the summit grow beautiful *Ranunculus macauleyi* with black-haired calyces, and *Aquilegia elegantula,* smaller and much more vividly colored than *A. canadensis.* In the eastern foothills, among my favorites of the many delightful plants are *Lithospermum cobrense,* only six inches high, with cream-colored tubes (why does its seed refuse to germinate?) a phlox close to *P. "mesoleuca",* thread-leaved *Malvastrum elatum* (?) with smallish



Eritrichium elongatum, *usually a turf plant, in a rock slide in western Wyoming.* E. argenteum *is more compact.*

deep red flowers. At Bonnell's Ranch (alas, not for many years active as a dude ranch), on one slope grew a wide selection of all the desirable plants of the lower hills, where Ralph Bonnell had scattered seed gathered while riding the range.

Just east of Albuquerque, an auto road leads to the top of the 10,000 ft. Sandia Rim. Here and there in the cliffs grow small colonies of *Primula ellisiae* and *Polemonium brandegii.* I can recall little else of interest, although many years ago dwarf white-flowered *Dodecatheon ellisiae* was discovered in this neighborhood, and so far as I know, has not been seen since.

Isolated Mt. Taylor, some miles west of Albuquerque, looks rather interesting when seen from the highway, but according to Wooten and Standley has no plants of special merit.

To the northeast of Santa Fe the last outlier of the Colorado Rockies, the Sangre de Cristo Range, terminates in Truchas Peak. The flora, like the mountains, is merely an extension from Colorado. Such plants as I have seen, at lower elevations, were few and dull.

The many interesting plants which Mr. Senior noted on the road north from Santa Fe were all conspicuously absent in August, 1958. In fact in most places the ground was as bare as the broom-swept dooryard of an Ozark Mountain native, and not until close to the Colorado line was there anything for which to stop: a tallish annual gilia with long-tubed lavender phlox blossoms.

COLORADO

The mountainous western half of Colorado is so vast and so high (fifty-one peaks rise above 14,000 ft.) that one cannot make even casual acquaintance with the whole of it. Last summer, standing on Mosquito Pass, I became completely demoralized by the vast tumultuous sea of peaks and snow-streaked alpine meadows extending to the north and northwest as far as the eye could penetrate; no map, no view from a lower elevation had prepared me for a vista of such magnitude. Behind me, the mighty Front Range was hidden behind clouds, while the massive summits of the Saguache (Sawatch) Range to the west concealed even more peaks than were revealed. Even the "little" Mosquito Range was of an extent which I had not anticipated. No one person could ever explore even a small portion of these peaks. Nor was there consolation in the thought that the flora is, at alpine heights, fairly uniform and wide-spread, or that Colorado was one of the first and most thoroughly botanized of all the mountain states. For almost at my feet Ripley and Barneby discovered, only a few years ago, a species neither inconspicuous nor scarce. How many more that are worthy of our gardens remain hidden, perhaps forever, in this mountain labyrinth?

The southwestern part of the state, often lush and heavily wooded, has invariably disappointed me, in spite of the number of distinctive plants reported from there. On a long circle trip from the La Sals in Utah through Paradox Valley to the base of Lone Cone, only once near Dolores was there a slope that intrigued me, although meadows were profuse with foot-high phlox and delphineums. Everyone who has mentioned the route over the mountains from Durango to Ouray, on the Million Dollar Highway, has had a dismal report on the plants there, although Red Mountain (No. 1, 2, or 3, I forget which) rising beside the road should have more than a few worth-while plants. Ripley, I believe, found a single specimen of the little form of *Erysimum wheeleri* which used to be known as *E. amoenum,* a treasure if we could obtain it; a forest ranger and I failed to find even one plant. The road, though excellent, is definitely not for nervous drivers. If they must traverse it, they should do so from south to north; then at least they will have the slight consolation of being on the inside track of a road carved along the sides of cliffs hundreds of feet high.

The little-botanized San Juan range with its sheer peaks is accessible by a dude pack trip in summer, but the formation of the mountains does not appear to be particularly encouraging for plants. The long climb from either direction to Wolf Creek Pass is through heavily timbered regions with, so far as I could see, no alpine zone within easy hiking distance. Wagon Wheel Gap had, even in the poor season of 1959, *Mertensia bakeri,* possibly a second species, and what surely must be *Campanula parryi* (no report yet on the specimens) growing in a riverside meadow, with a few plants of *Polemonium brandegii* on a nearby cliff. I was "under the weather" that day, and remain convinced that if I had had the energy to scale one cliff that I gazed on half-heartedly, there the polemonium would have been found in quantity.

Monarch Pass, to the west of Salida, is to me barren and unattractive. Although it is above the tree line, no good plant, nor suitable home for a good

Kalmia polifolia *var.* microphylla *growing in ice water beneath a snowbank on Beartooth Ridge.*

plant, can be seen. Kathleen Marriage told me that she had found little of value there, but from somewhere in the region Ripley and Barneby returned with an extensive harvest, including what they called *Eritrichium howardii,* a superlatively beautiful plant which I had supposed to be a rarity of the Northern Rockies only.

North from Salida, the road to Leadville rises so gradually that one would be barely conscious of being in the mountains, were it not for the great peaks of the Sawatch Range a few miles to the west. Mount Princeton, Yale, Harvard, what plants grow on them? Reference to collection on any of the three is almost nil, yet the first, at least, should make many plants happy. A little south of Leadville, Colorado 82 turns off toward Aspen, and climbs to 12,095 ft. at Independence Pass. The road has been described to me as one to be avoided, and as one which offered no obstacle to a station wagon pulling a

boat on a trailer. I have yet to investigate, but there should be good hunting along the way.

The mines at Leadville are inactive, but enough—and not too many—tourists visit the town to permit it to maintain a few motels, the refurbished Vendome Hotel of its boom days, and two good restaurants. Jeep trips are available to the surrounding mountains, but the price of $7.50 per hour, together with the high cost of living at 10,000 ft., places them tantalizingly beyond my reach. Yet the region has great rewards for even the impecunious: one may drive eastward from Leadville over an excellent dirt road for about five miles, to where a gentle stroll brings one into the alpine zone of the Mosquito Range. Even within a few feet of where the car has been parked choice plants appear, and *Polemonium confertum* and a host of dwarf erigerons descend to rock outcrops in the meadows.

The rest of the road to the pass is long and not for cars. Doubting that even if we had the energy to hike to the summit, we should have adequate time left for collecting, Jack Furcha and I hired a four-wheel-drive pickup to take us to the top in less than an hour from Leadville—and thanks, I'll walk next time. The road, really not bad for a mountain one, is gouged out of rock slides, with hairpin turns almost too sharp for the truck (it did not have to back around any, to my relief), while, chiefly on the driver's side, slides and cliffs drop away forever—though actually it cannot be much more than a thousand feet to bottom. Perhaps my urge to open the door and jump out was caused by the entrancing clumps of alpines still in full bloom in late August—at any rate, one misses a good many plants by riding up, for alpines are always best seen from below.

We said goodbye to the truck at the pass, and set out to explore in an icy gale which drove sleet and snow almost horizontally at bullet-speed, but were soon forced to seek shelter on the lee side of the mountain, with only brief forays onto the exposed ridge. It was late in the season, plants near the summit were limited in quantity and variety (I could find but three *Eritrichium argenteum*) and some species which Ripley had noted remained invisible. As we descended, we were kept frantically busy harvesting the most generous crop of seeds I have ever encountered. In the excitement, some of the less impressive species were collected too scantily to meet an unexpected demand for them (particularly the senecios) and perhaps a few were overlooked entirely. Here is an incomplete record of species met in the valley and on the slopes and slides of the Mosquito Range, from somewhat under 12,000 to 13,200 ft., during two days of collecting: *Anemone globosa, zephyra* (the American version of *A. narcissiflora*); *Aquilegia caerulea;* a dainty six inch arnica; *Oxytropis podocarpus* (?); *Besseya alpina;* a calochortus in unripe seed; *Caltha leptosepala;* at least two, perhaps more, castillejas; *Chrysopsis villosa; Claytonia megarrhiza;* two dwarf cruciferae which I could not recognize; a draba or two—there should have been more; *Dryas octopetala; Erigeron pinnatisectus* and perhaps another half dozen still unidentified (there was so much variation that one often could not decide whether one was collecting distinct species or forms of the same species); an eriogonum; *Eritrichium argenteum; Erysimum glaciale* (*radicatum—nivale* in Farrer); *Gentiana parryi, romanzovii; Gilia (Leptodactylon) nuttalli;* a dwarf heuchera; a large lupine; *Lychnis montana; Mertensia alpina* and another that may be *M. ciliata; Penstemon whippleanus; Phacelia sericea; Phlox caespitosa condensata* (*?*); *Polemonium confertum;* assorted potentillas; *Primula parryi, angustifolia; Rydbergia grandiflora;* one or two prostrate salix; *Saxifraga caespitosa, simulans;* a rhodiola with cymes of brilliant red; *Senecio blitoides* with fleshy leaves, *S. petrocallis* (?) and several other dwarfs; *Sieversia*

ciliata and *S. turbinata; Silene acaulis; Smelowskia americana;* two dwarf trifoliums; *Trollius albiflorus.* How many others we failed to observe can be answered only after a return visit, but I know of several that we missed.

Yet here, and elsewhere in the Colorado mountains, the vast extent of the alpine meadows and rocky slopes permits most species to grow in such vast numbers and to recur at such frequent intervals that eventually one becomes bored by the monotony of meeting the same plant again and again, and almost longs for the smaller mountains where one must hunt desperately to find more than a few specimens of all but the most common sorts. Variety and suspense give spice and excitement to plant hunting.

Many miles to the northeast of Leadville, U. S. 6 crosses Loveland Pass at 11,992 feet. In spite of the nearness of Gray's Peak peering at one over the shoulder of another mountain (and Chester Strong tells us that Gray's Peak is the focal point of the alpine flora of Colorado), the plants around the pass are relatively few and impoverished. While tourists may be responsible for the scarcity of some, they cannot be blamed for the lack of enthusiasm on the part of the plants themselves. Even for those who wish to see Colorado alpines with a modicum of exertion, Loveland Pass is hardly to be recommended, in spite of an article in the *Bulletin* some years ago extolling its virtues. And yet, perhaps, because I was disappointed by the neighborhood of the pass, I gave up too quickly: those slopes in the direction of Gray's Peak, in memory, look most inviting.

Pike's Peak, long Mrs. Marriage's chief hunting ground, is incredibly rich in good plants, a few of which seem to be endemic to a very small region. I have never been up it, but some day I must investigate, in spite of the hordes of botanists collecting there, and the Chevrolets whizzing (or so the ads claim) up the dirt road to its summit. Perhaps Pike's Peak, and (for those who can look without picking) the great alpine slopes of Rocky Mountain National Park are the places one unfamiliar with the Rockies should visit first; later, the more remote ranges with their surprises and possible disappointments.

In these all too lengthy notes I have sought to recapture the memories of ten trips, spread over more than twenty years. Memory is at best inaccurate, but it has been refreshed by revisiting most of the localities mentioned during the past two summers. By no means all the interesting areas, nor all the desirable plants, have been mentioned. Whenever I have been uncertain whether Nature, or fond recollection, set a plant on a certain cliff or scree, I have refrained from making a guess. At times the reference to stations has been unavoidably vague, for on uncharted and usually trailless peaks, only by lengthy detail can one person tell another the landmarks (or lack of them) which will serve as guide to the goal. Occasionally, when dealing with the home of some great rarity, the vagueness has been deliberate, for most of the sport and thrill of finding a treasure comes from meeting it after long and desperate search, not from being led by the hand and having it pointed out at one's feet. Yet never have I led you astray: I have not reported a cliff plant as growing in meadow or bog, nor a distance as five miles when in fact it is nearer twenty, nor a plant as growing in one range when its home is two ranges farther over. Barring cataclysms of nature or of human "progress", the plants will be found, without undue search, where I have said that they grow.

Regarding the names that I have used, I cannot be so positive. Collected specimens have at times been inadequate, taxonomists have been known to change their minds, and experts to differ in their verdicts. If at times I have erred, bear with me—and let me know, so that the record may be set straight.

SOME ROCKY MOUNTAIN PLANTS

ROBERT M. SENIOR, *Cincinnati, Ohio*

A NUMBER OF YEARS AGO, when I was talking to a western nurseryman specializing in Rocky Mountain plants, he expressed the opinion that nearly all of them, in order to be grown successfully, require an acid or at least a neutral soil. Possibly it is true that a majority of these species will not thrive east of the Mississippi in a limestone soil. For instance, here in southwestern Ohio, which is essentially a limestone country, we have tried in vain to raise such plants as *Gentiana parryi* and *G. calycosa*, and of course acid-loving vacciniums, gaultherias, and phyllodoces we have never attempted. On the other hand, in the course of a lifetime, we have raised scores of Rocky Mountain plants that have lived at least a couple of years. Since there are many that have hardy constitutions, I should like to mention some that even a novice in rock gardening could raise, provided he could put plants in well-drained soil, and possibly cater to the special requirements of some of them, such as a pane of glass over them in winter.

Of course we are accustomed to hearing that a light soil is essential in order to have success with most alpines. There is one delightful low-growing plant that in its native habitat seems to be an exception, in that in both Colorado and New Mexico we found it growing in rather heavy ground, often on some rather barren slope. This is *Pachylophus macroglottis*, a member of the evening primrose family. In our garden it comes up every year, and with its underground runners, may spread rather rapidly, but if in the course of years it covers too much ground, the new shoots can be removed easily, and if desired they can be planted elsewhere. The plant has huge white flowers which, as they fade, slowly turn to a pinkish shade. Incidentally, if you ever look for the hard seedpod, you will find it at the base of the flowering stem, barely above the surface of the ground.

Another plant that does not necessarily require a very light soil is *Phlox nana*, which is about twelve inches high, and has delightful flowers. This plant we found growing by the roadside, not far from Santa Fe. If you ever visit this section of the country in midsummer, you are almost certain to find it. The flower varies in color from a dark pink to maroon, and sometimes one is found with a white eye.

Geranium atropurpureum, of which the type specimen came originally from Santa Fe Creek, is somewhat prostrate with flowers a bit smaller than those of the well known *G. sanguineum*, but the bloom is of a rose-purple color, possibly nearer a shade of purple than that of any other geranium we have ever raised. We find that it should be planted in soil that is not rich, otherwise it tends to send out rather long runners. I have sent our Society some seeds, and if someone should succeed in crossing this plant with the above-mentioned *G. sanguineum*, the resulting hybrid might be interesting.

Speaking of Santa Fe, I am inclined to think that rock gardeners living in southern Ohio, westward to Missouri and Kansas, will have greater success with flowers growing in the highlands and mountains of New Mexico, than with Rocky Mountain plants growing much farther north. At least that seems to be our experience.

Zinnia grandiflora, formerly classed as a *Crassina*, is another New Mexican plant that we once found growing in northern New Mexico in the northern part of the state, and which we raised from seed. Wooten and Standley, in their "Flora of New Mexico," mention it as a handsome plant about eight inches high with masses of butter yellow flowers that remain in bloom throughout the summer. One characteristic of the flower is that the rays are persistent, and after

Robert M. Senior

Zinnia (Crassina) grandiflora, *An occasional roadside plant In New Mexico.*

the flower fades, they remain on the plant for many weeks. Although we found this plant in New Mexico, I believe its range extends into several neighboring states. Once established, the plant ought to remain with you for many years.

If you care for chryopsis, you should be able to keep it almost indefinitely. Both *C. villosa* and *C. hirsutissima* are almost indestructible. The latter we found in northern New Mexico. Last fall, on October 20 it was still blooming in our garden. The yelllow flowers are not particularly large, but they have a long period of bloom.

If you travel in the Rockies, you are almost bound to encounter some eriogonums, which belong to the buckwheat family. Possibly the best known is *E. ovalifolium*, a more or less caespitose plant with tomentose leaves and yellowish flowers. Once established in a light well-drained soil, the plant should live for many years. However we find that it resents moving, and possibly it should have a pane of glass over it in winter.

Another plant that we have had in our garden for many years is *Eriophyllum lanatum,* a composite about eight inches high with yellow flowers on rather long peduncles. If I remember aright, we found seeds of this plant in Idaho. In October there was still some scattered bloom on it. The plant now covers over two feet of ground.

Malvastrum coccineum has an exceedingly wide range, extending from New Mexico to British Columbia, and eastward into the Great Plains. It really is an attractive plant, about six to eight inches high, with brick red flowers. I am inclined to think it should be planted in poor soil, else it is inclined to get leggy. As you drive along some unfrequented lane, perhaps in Montana, you may find it growing along the roadside, sometimes half covered with dust.

This article, in the main, was written with the idea that the "beginner" in rock gardening might like to try some "easy" plants other than the old standbys, such as *Phlox subulata* and *Alyssum saxatile*. For the old rock gardener who likes to try plants that are difficult to raise, the account of those mentioned will not be of any great interest.

A FEW PLANTS OF THE ROCKY MOUNTAINS

CHESTER K. STRONG, *Loveland, Colo.*

IS IT WELL to write of attractive plants which a gardener has little opportunity to secure, either as vegetative material or as seed? Perhaps it is unfair to do so, but nevertheless there is a score or more of plants native to the central Rocky Mountains which are attractive and should be borne in mind by gardeners, and which are at present less inaccessible than they have been in recent years. Rocky Mountain plants have a record of being recalcitrant and nearly impossible in gardens, but this is true of nearly all plants which grow above the line of timber in the high alpine-arctic zones of the earth. I have found all such plants difficult; a gardener to achieve meager success must create a suitable environment for the plant, for few indeed are the ones which can be "bent" to meet the gardener's desire.

The plants discussed here are not all found above timberline, for some appear in habitats less austere than the high zone, and they represent some of the plants which I know best after an acquaintance of thirty years. These are plants for which I have true affection, and which I am always happy to meet, just as one is made happy in meeting any proven friend.

I am certain I know the exact instant when my interest in mountain plants turned from casual, pleasant viewing to a deep interest which has since maintained itself. On a bright, very cheerful morning I went up a gulch called Deadman's, for the body of a miner had in earlier days been found in a cabin on the gulchside, but now more appropriately called Butterfly Gulch. The upper end of the canyon was rimmed with a rock outcrop, above a very small mountain lake. While the ascent was not difficult, being fresh from city pavements I was exhausted at the top and lay on the gritty earth to rest.

When I opened my eyes I was still beneath a caerulean sky, spotted with white clouds whipped to a delightful consistency by challenging air currents, but all was changed, for before my eyes was a diminutive flowering plant which I felt the most attractive in form and coloring that I had ever met, although I did not know its name. To this day I feel that rock jasmine, *Androsace (Drosace) carinata,* must be placed within a group of plants of peculiar witchery.

The plants are caespitose, the rosettes somewhat depressed, and the maximum height is some three inches, usually less, including the furry stem and the flower. White or more often cream is the color of the flower, and this the color of country cream, say in June, for it is near to a mild yellow, rich indeed; and the eye of the diminutive corolla is yellow, deep orange, or, some observers say, pink. The foliage remains in the mind as gray, being green with a covering of fine white hairs.

The genus is within the Primulaceae but resembles in growth habit few of the true primulas. Usually it is found in coarse soil, perhaps granitic scree, but often in any soil of this type that contains an ample supply of humus. Any of the soils in which it grows may become powder dry or brick hard in summer, but in spring they have a soggy consistency. Only those who have been on the mountaintops in late May or early June know just how moist such fields become under melting snow.

Androsace carinata is a small deceiver, for plants grouped at the base of a protecting boulder or spread in a colony in splendid dryness under a beating summer sun are not what they appear. Apparently the observer sees a group of individuals, each rosette an entity, a plant in itself; investigation discloses that many in a colony are intimately related, in fact are but parts of one plant which runs underground and throws up a gray rosette at rather regular in-

tervals, the spacing being controlled by some power with which I am not acquainted. In the case of this charmer it could be mere whimsy. The plants are difficult to transplant and the capsules are few-seeded, making the harvesting of a supply of seed quite tedious. Its range is high, 12,000 to possibly 13,000 feet. For gentle modest beauty *A. carinata* has few rivals.

A part of the attractiveness of plants is their independence, their tendency to follow no plotted course of normality. I was once asked what I admired in *Lloydia serotina,* a "third rate wild onion", as it was termed by this detractor. I had little in defense of the plant if the non-gardener did not approve of it, but my mind went to the splendid ability of this small species to toss away the rules concerning distribution and to spread itself over the earth. From the Snowdon range in Wales to the Rocky Mountains, and north to the rim of the Arctic it has travelled, and has found a home in the Alps and in the Pyrenees as well as in northern Siberia and those strange lands bordering Lake Baikal and the Altai Mountains deep in eastern Asia. One must continue to marvel at the plant's ability to travel, for there is nothing to indicate that it has special gifts in his respect. It is bulbous and has a reasonably heavy seed, not one which would drift vast distances in air currents.

Lloydia serotina is a slender plant, not significant unless found in great or lesser masses. It comes rather easily from seed and, being bulbous, transplants without great objection if the bulbs can be found after the flowers fade and the foliage ages. Both petals and sepals are creamy white, veined with purple, and sometimes lightly touched with pink on the outside.

Another bulbous plant of the mountains, not of the high zone as is lloydia, but extremely well gifted in grace of form, is *Zygadenus elegans.* The flowers are many but small, most dainty, in spike-like racemes, reaching a height of some sixteen inches. Cream is the dominant color of the flowers, with both sepals and petals spotted with green and yellow. The vernacular name of the plant is death camas, or according to many ranchers, death chemist, and although it is easily grown its poisonous qualities should exclude its careless use in gardens.

Growing in the turf of meadows at possibly 5,000 to 8,000 feet is another plant which comes from a bulb. The small sand lily, *Leucocrinum montanum,* has through eons of time built itself to near perfection, having no crudeness remaining. This small lily is probably more a plant of the plains than of mountains. Its leaves are relatively long and narrow, very uniform and of a pleasing green, somewhat upright but often lying close to the ground to create a handsome pattern. The flowers are true white, of a clean waxed appearance, with no stem at all, rising directly from the leaf bundle. The combined effect of flower and foliage is rather geometric and very good.

Usually the plants are found in lean gravelly soils. As the flowers are stemless and the seed capsule is developed within the foliage at about soil level, the mechanism for seed distribution is limited. Strong winds may help with the distribution, for the seeds are spherical and roll before the wind.

Some of the meadows in Estes Park, a natural open basin lying east of Rocky Mountain National Park, are often white with the flowers of these small plants. Under this open condition the plants are surprisingly evenly spaced. This is not always true, for the plants which I once collected ahead of bulldozers had a quite different habit, as they grew in tight clumps, building up with one plant practically above another until they formed mounds close to a foot in height, and when lifted yielded a hundred or more plants. These were growing in a waste covered to some depth by very fine cinders, and it was probably the wind-shifted clinkers building up into mounds which stifled the spread of seed, which as a result germinated on the spot and the new plants crowded in with their parents.

Not long ago, I read a report from gardener who treated small iris-like *Sisyrinchium angustifolium* and its near kin with some scorn, but I feel that a gardener who cannot find a use for the blue-eyed grasses is at fault. The most commonly found species in this range are the above and *S. occidentale,* with only minor botanical differences. Both are often found in association with turf-forming plants and are easily overlooked. These small plants with their almost rigidly upright foliage and bright star-like blue flowers are certainly compatible with aged weathered rock, a material which creates for them a perfect backdrop. Once established their attitude is one of scorn to care, yet in my experience they have never become weeds.

A larger relative of the sisyrinchiums, *Iris missouriensis,* in my belief deserves more than to be dismissed as "common blue flag". It constitutes very usable garden material, although in no sense unique. Like its small relative it is found in moist places and sometimes when undisturbed spreads to cover a number of acres, converting a meadow into an expanse of pleasing blue.

I have plants whose progenitors grew at about 12,000 feet in a gritty soil which was far from moist, and they do not seem to miss a moist environment when removed from it. The plants grow to a height of eight to sixteen inches, but increase their stature under cultivation. They are modest creations, not gorgeous ones. For a number of years I watched a group slowly spread to form a colony at the base of massive boulders, and I thought them very handsome in that situation. They were set at the front of a log building, a portion of a venerable mountain inn. The last time I passed that way I noted that both boulders and plants had been tumbled away to make room for additional parking.

The foliage of this iris is not evergreen, and it is possible that plants are lost from being set too deeply, allowing water to lie at the crowns and cause rot. There is a white form rarely found amidst its blue sisters, and intermixture of the colors is effective. Possibly it is a biased viewpoint, but the thought persists that plants growing at higher elevations are more attractive than those found at lower altitudes. For this there is no explanation other than that to the mountain wanderer it appears that in the rugged mountain zone a sturdy plant has found a proper home.

Two other bulbous plants might be presented, both quite well known to most gardeners. We searched long for the snow lily, or yellow fawn lily, which in this area is *Erythronium grandiflorum* ssp. *chrysandrum,* differing somewhat from the type. We followed various leads but found no brilliant yellow lilies until we wandered over a road farther north than where we usually hunted. On this day in mid-June we did not find merely a few stragglers, but drove into fields of them, massed and spread over many acres. They were flowering across high meadows and on sparsely timbered slopes. On the meadows they were accompanied by weedy low-growing ranunculi with bright yellow flowers, creating in many places carpets of deep green and yellow. Through this carpet the erythroniums grew, forming islands in the small sea of buttercups.

I have never attempted to grow this erythronium, not because I do not appreciate the beauty of its flowers with recurved tepals, above two thick basal leaves, for that I do, but rather because I could not in the past provide the special conditions which they should have. In producing plants, and later, flowers from seed the genus follows a rather involved and devious routine. To produce them in this manner patience would probably be the greatest asset. The display of plants which we originally found is pleasing to the extent that Mrs. Strong and I return each summer over a long, unpaved, awe-inspiring road, often dangerously wet, to view the fields.

The group of plants comprising the genus Calochortus is usually represented by one species, *C. gunnisonii,* admittedly not as colorful as some relatives found farther west. Oftentimes these plants are in tall grasses on hillsides or in meadows where their swaying flowers, two or three inches in diameter, dance well enough in the wind but do not display their graces as effectively as when found in a woodland environment. The segos, or perhaps more euphoniously the mariposa lilies, look well in combination with the white boles of aspen trees. Under a light mountain wind the rather broad flowers on thin wire-like stems move in concert to resemble air-borne butterflies, which the name "mariposa" indicates. Although I have had some experience with calochorti my knowledge is such that it would but confuse and not enlighten: bulbs which were brought in last year sat smugly through a season, neither rotting nor sprouting, inspiration to grow (or to die) never reaching their sensibilities.

Tonight beneath a fall of new snow on a lesser peak near the Continental Divide rests a small colony of plants in which my interest remains, although it has been a number of years since last I admired the group. These are small plants, at best no more than two inches in height, and like many other alpine species they are coated with fine hairs and have the odd appearance of wearing raccoon coats in a casual way. The flowers are disproportionately large, another characteristic of alpine plants, of bright yellow discreetly touched with red.

This colony of *Saxifraga flagellaris* does not ask for the protection of boulder or of other vegetation, as the members sit boldly on a bald knob of clay, exposed to all the great winds which strike. They feel the heat of summer sun and make an obvious pretense of being desert plants, for the site is often dry and thoroughly baked. The colony came under my observation one hot day in midsummer, and certainly the members were in straits—to me it seemed dire straits, but to them no doubt it was routine, and possibly in that situation it had always been hard for them to make a decent livelihood. For the Rocky Mountains are not moist mountains: rains come some summers with regularity but they are unlike rains of lower altitudes, for they are delicate mizzles, lightly cargoed clouds passing by, dragging their bottoms over the peak, yet more than fogs, for very soon clothing becomes saturated with moisture. Moisture in this form drifts over the peaks and down the huge defiles lighting the color of the lichens and watering thirsty vegetation, but when such rains are absent severe drought years develop. There are, to be sure, other forms of summer moisture, driving rains, beating sleet and hail, rarely summer snow, but the small drifting curtains of moisture seem to be what the plants most desire.

From manuals, the impression is gained that the whiplash saxifrage multiplies its kind by the expedient of sending forth the whip-like flagella, which root as do the runners from strawberry plants. Observation indicates that they do use this method of propagation in moist situations where the young plants at the tips of the runners have an opportunity to strike root. The species is careless in the making of anchor roots, and I am under the impression that three years are required for them to drive down taproots.

In form this small saxifrage resembles some of the sempervivums, never as succulent as that genus but similar in form. At times they are found in tight rosettes, at others the rosettes are spread open upon the earth, the variation being controlled by moisture. When drought comes the plants pull their foliage into a tight little ball to conserve moisture. When I came upon the colony on that hot summer day some members were rooted and from lower depths were securing moisture, but were tightly constricted; others were uprooted, or had never made roots, and a mild wind was toying with them, rolling them here and there,

their small bodies dessicated, pulled into tight balls as light as ptarmigan down. I set them in a small protective depression, went down the mountainside for water, wet them down, placed my jacket over them for shade, and at the end of an hour they were quite revived. On a later visit I found them as robust as plants their size could be, but I have not seen the colony for about four years. The point of speculation is whether or not these plants use this device to spread their colonies, allowing the wind to carry them to new rooting spots, thus forming new centers of growth. There are other saxifrages in that and adjacent areas, some very weak plants such as *S. debilis* and *S. cernua.* In contrast *S. arguta* is a robust plant found at about timberline, sometimes in the open, often in semi-shade, but always rooted in streamlets coming from melting snow. It is past explanation how some species of the genus, such as *S. debilis* and *S. cernua,* are able to maintain themselves under the conditions in which they grow.

Saxifraga chrysantha, the golden saxifrage, very definite in form, is a plant which the gardener would be foolish not to covet. Members of this species are sometimes found singly or in groups in turf over rocky soil, where they never appear happy, for essentially they are fissure or crevice plants. This I proved to my own satisfaction at the slight cost of thirty miles of tramping in new boots which laid blisters all over my feet, one above another. The memory of that day remains painful, but certainly there were compensations.

Some of the area adjacent to Loveland Pass is heavily sheeped, and where sheep linger vegetation does not remain in its pristine condition. Such lowly plants as the golden saxifrage are often a portion of the turf, but on the other hand I think that if I were a sheep I should search out and feed upon this plant, for certainly its general appearance is appetizing, a delectable small fodder. Some of the terrain that I passed over that day remains as a shadowy ordeal, for there were hours spent in crossing impassable boulder fields, knife-edged ridges thin enough to split raindrops to pass over, and rock slides as treacherous as spring snow cornices to descend. In the end it all came out well, for I found *Saxifraga chrysantha* in abundance in an environment where I expected to find it; and for good measure, I found magnificent plants of *Claytonia megarrhiza.*

The saxifrage I found in the crevices and fractures of a monolithic granitic boulder, the plants flowing in cascades where fissures gave them roothold; streams of olive green foliage, yellow flowers and stems of mahogany red. Wherever there was soil or humus the plants grew, and on small ledges and terraces spread out in green and yellow pools. It was with some difficulty that I reached the plants, but when I did I knew that I had been where cropping sheep had not gone before me.

It was farther on that I came upon the big-rooted spring beauty, *Claytonia megarrhiza.* If one's acquaintance with the genus is limited to *C. lanceolata* or *C. virginica,* a new image of a plant must be invoked to encompass the comparative massiveness of the mountain dweller. Happily I have memories of *C. lanceolata* growing in a neighborly way beside the handsome foliage of fawn lilies, or tucked in some appropriate rocky cleft where their pink or rose flowers could be displayed to the very best advantage, and I have no reason to detract from their native beauty.

On the mountain road to the top of Mount Evans, directly west of Denver, plants of *Claytonia megarrhiza* in some areas are found in great numbers, undoubtedly rooted in fractured rock beneath a thin layer of soil and humus. Although these plants are numerous and of great beauty, they are small in comparison with their fellows of the high rock ridges.

In the McClellan Range, on the escarpment overlooking Gray's Basin I once found a giant plant, so located that by chipping and prying at the fractured rock the taproot could be followed downward to a distance of a dozen feet, and at that point it was still driving downward, for unlike the smaller species, *C. megarrhiza,* true to its name, develops a gigantic taproot, not a corm. This was the largest plant which I ever discovered, but one which I found following my contact with the golden saxifrage bore a greater number of flowers. As is customary, this plant grew with its root driven into a fracture of the rock. Coming upon these large plants one is almost convinced that such things cannot be, for the handsome lushness produced at the top of a barren, austere peak seems impossible of reality. The foliage forms a neat mound, possibly a foot high, but all parts come from a common crown and the plants are not cushion-forming. The entire plant would fit neatly into a half-bushel basket, perhaps with a little room to spare. It appears as a mass of delectable salad greens.

In appearance the flowers are very similar to those of the smaller species, white with rose or pink stripes and markings, but are offered in greater numbers. The giant just mentioned bore more than a hundred and fifty flowers by actual count, some within the foliage, but most in evidence, appearing just without the dense foliage of pleasant green. The plant has a habit of sending out a circlet of flower stems about its base, and at the height of bloom the specimen stands within a garland of its own making. The giant plants, it has been my experience, are always found on topmost sites well above timberline, and are always rooted directly in crevices. Immediately below the crown the taproot is an inch or more in diameter, deep purple, and the plants have every appearance of having reached great age, but of having retained youthfulness and vigor.

Below this high ridge, slightly below timberline, there is a bog with drier hummocks where the upper portions of boulders are exposed, in this case of red or pinkish granite; clustered about them grow the shrubs of the dwarf *Kalmia polifolia* var. *microphylla,* often referred to as a depauperate form of mountain laurel. The plants cling to a bog environment, no doubt, partly because of an acid condition of the soil. Individuals are diffusely branched and hug closely to the boulders, their rose, pink or lilac flowers, beautiful as those of most of the genus, displayed slightly above or directly on the worn lichen-etched rocks.

(To be continued in July)

ARTHUR H. OSMUN

Word has reached us, belatedly, of the death of Arthur H. Osmun. A former president of the Society, he was until recent years owner of Paramount Gardens in Plainfield, N. J., from which many choice plants were distributed. He was well known to older members of the Society, and was noted for his remarkable collection of violets.

BOOK REVIEWS

Sedum of the Trans-Mexican Volcanic Belt. By Robert T. Clausen. 380 pages, illustrated. Ithaca: Cornell University Press, 1959. $7.75

Subtitled "An Exposition of Taxonomic Methods", the book is exactly that. Beginning with a statement of three of the principal methods of taxonomic comparison, Dr. Clausen states his postulates for sound classification, traces the reasoning that has resulted in the procedure which he follows, and indicates in minute detail exactly how he has conducted his investigation. The results

of study in the field and in the herbarium, of growing collected material under identical conditions in greenhouse and coldframe at Cornell, and of examination of the literature, are all combined in the final verdict.

The major portion of the work consists of a detailed analysis of the twenty-eight members of the genus *Sedum* native to the volcanic belt stretching across central Mexico. For each species the treatment is the same: distinguishing features, description (height, leaves, inflorescence, flowers—sepals, petals, stamens, nectaries, pistils, follicles), variation, distribution, relationships, and associated plants. The descriptions are presented statistically in tabular form: number of plants studied, the number of observations of a particular characteristic in the whole sample, the arithmetical mean of the sample, the standard deviation and the observed range of variation of the sample.

In the concluding chapters, after separate keys to the species in flowering and in vegetative or fruiting condition, the author considers the relationships among the species described, evaluates methods of study, and states the conclusions he has drawn from his investigation.

While the plant material covered is of relatively little value to horticulturists (especially as only one species has proved hardy in the open at Ithaca), the methods of study outlined in the book should prove of great interest to gardeners, particularly to those who are inclined to resent the frequent changes of nomenclature. The procedure followed here is one which the reviewer has long felt offers the only solution to the problem of relationships between closely allied entities: they must be studied in the field, and under identical cultural conditions, as well as in the herbarium, before a really conclusive verdict can be reached. Dr. Clausen is conservative in his viewpoint, and it may well be that more radical thinkers will disagree with some of his conclusions, but at least we have presented here, perhaps for the first time, a really thorough record of all the factors (other than genetic or physiological ones) of importance in determining specific limits. One hopes that all future taxonomic studies will be as exhaustive; then, perhaps, the subject will reach a much-needed state of relative stability.

Handbook on Breeding Ornamental Plants. George L. Slate, editor. 113 pages, illustrated. New York, Brooklyn Botanic Garden, 1959. $1.00

This Handbook does much to satisfy a long-felt need, for available works on genetics have been either too technical, or too elementary and amateurish, to be of any real value to the gardener who would like to do a little hybridizing intelligently. Dr. Emsweller's contribution, "Fundamentals in Plant Breeding", together with excellent illustrations of meiosis and mitosis, and some remarkably clear definitions, should give the untrained reader an adequate acquaintance with basic genetic principles. The articles that follow, dealing individually with plants which are among the most popular subjects for hybridization, will guide the amateur experimenter in his particular field of interest, and will give him standards by which he can evaluate his own creations. This Handbook is definitely a "must" for the amateur breeder.

Handbook on Bulbs. R. W. Oliver, editor. 96 pages, illustrated. New York: Brooklyn Botanic Garden, 1959. $1.00.

Although the current Handbook follows the familiar pattern, and the illustrations are of the usual high quality, the text leaves much to be desired. While there are a few excellent articles, many statements are inadequate, vague and misleading, or erroneous. Lists of species and varieties, where any are given, usually omit at least part of the desirable and readily available kinds, and include some that cannot be obtained through any dealer.

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