

MARIPOSA

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MARIPOSA**THE CALOCHORTUS SOCIETY
NEWSLETTER**

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I. Announcements**A. FREE SEED OFFER**

To obtain free seed, please send a stamped, self-addressed envelope with your choices. Overseas send 60 cents or an international postal certificate (please be sure it is correctly stamped). Each member may choose three species:

From section *Calochortus* (all first time to members):

1. *C. coeruleus*, Beavertail Nut Grass from Amador County in the Sierra Nevada Mts. Variable from all white to white with purplish base and densely covered with hairs on the surface; short. This charming species requires both cold stratification and annual winter chilling and is not recommended for mild climates except for dedicated growers. Keep in shade.
2. *C. umbellatus*, the Oakland Star Tulip from one of its largest stands in Marin County (see photo in *Mariposa*, VIII, 4). Short, white (in this stand), takes sun to part shade, moderate water.
3. *C. howellii*, Howell's Calochortus, from Josephine County, Oregon (see photo in *Mar.* IX, 1). Tall and showy, white flowers with a dark base and covered with short hairs. This species has germinated in Berkeley, where the climate is mild, but may require cold stratification in even milder parts of the Southern California Coast. It should do OK inland in S. Calif., especially if started on the north side of a structure. Then full sun, plenty of water (see growing tips in IX, 1).

From section *Mariposa*. (All first time to members).

1. *Calochortus catalinae*, the Catalina Mariposa, from Los Angeles County, lovely, tall species with either monochrome or bicolored pink/white petals with a reddish dot at the inner base. This species does fine along the coast, but is not that hardy inland; if you're colder than zone 9 USDA, start it in spring or late winter after danger of frost. Full sun, moderate water. Although it's from Southern California, it generally grows on the windward, wet side of the slopes so tolerates a good amount of rain. Does fine in Berkeley.
2. *Calochortus nuttallii*, the Sego Lily, Utah's state flower. This seed was collected across the border in an Arizona stand. Crisp white flowers with a magenta-brown band at the base. Germinates in Berkeley, but may require cold stratification along the S. Cal. coast; OK inland. Must be kept on the dry side; normal rainfall in S. Cal. but less in No. Cal. I grow it in a protected setting and hand water to prevent it from damping off. Very hardy.
3. *Calochortus ambiguus*, the Arizona Mariposa, from Yavapai Co. (see photo *Mar.* VII, 1). It is difficult to praise the beauty of this plant too highly and it is my favorite species from outside of California. Most bicolored lavender- or purple/ white but some may be all lavender. The stand from which the seed was collected is in immanent danger of destruction, although the species itself is not rare. This one also germinates in Berkeley, but may require cold stratification in even milder parts of S. Cal. Again, normal rainfall in the south, but keep on the dry side in wetter areas. This is not a desert species, but still is used to dry conditions. Sun, hardy.

From Section *Cyclobothra*.

1. *Calochortus plummerae*, Plummer's Mariposa, from the Transverse Ranges of Southern California (see photo *Mar.* VII, 2). I got my seed years ago from Theodore Payne and have slowly increased my stock over the years. I do not know where they collected it, but I suspect from the Santa Monica Mountains. This is seed from my own stock; I finally have enough to offer members. Easy culture; does fine in Berkeley but also fairly hardy. Tall, showy, variable in color from pink and bicolor to a deep purple, with hairs on the inner petals. Sun except in very hot areas. Moderate water; rainfall

only in normal years.

First time to members.

2. *Calochortus nigrescens*, the Black Calochortus from the mountains in the Mexican state of Oaxaca (see photo Mar. VII, 4). This is a very dark flowered species, of a deep red or violet almost black color, sometimes with greenish sepals and with nodding bell-like flowers. Reversing the California pattern, the Mexicans require drying out in winter, including storage in a place where they will not freeze, and summer watering. Part shade, moderate water.

3. *Calochortus spatulatus*, Mexican bells, from stock, collected in Michoacan and Mexico states (photo Mar. VIII, 1). Brownish-purple petals often highlighted with yellow and with hairy, yellow interiors. Easy culture; moderate summer water, dry in winter. Probably not hardy, but dormant in winter anyway, so can be stored in temperate areas. Shade.

II. Trips

By the time we hit Tepic, the capital of the state of Nayarit, it was time for another night's rest. We found the Hotel Humberto there--with 40 pesos for a single, and 60 pesos for a double. All three of us could stay there for just \$14.00! What a bargain! The receptionist was very helpful, and later brought us clean drinking water, towels and a television set. Hugh and I watched some kind of program that was the local equivalent of the old "Candid Camera." It was very funny. We also had a local chocolate bar, which was less sweet than American candy bars, and more chewy.

Wednesday morning, we got an early start after a good night's sleep. We wanted to change more dollars into pesos, as well as get in a little tour of Tepic itself. Not far from our hotel was a bank, but they would only open at 9:00 AM. People at the insurance company housed in the same building told us of the Banamex bank up the street that was already open for business. We found that the exchange rate had now increased to 7.40 pesos per dollar, and Hugh and I wondered aloud if this was a reflection of the political unrest in Guerrero. Could it be that dollars were more valuable now, due to the political situation there?

We then took our time, tooling around Tepic. This is a lovely old city of wide boulevards, dotted by trees, and containing huge parks. The highway winds around the downtown area, and there are numerous shops all over. In addition to the ubiquitous car mechanic shops, there were doctors' offices, boutiques for children's clothing, a hospital, a Ford dealer, and many other interesting stores. There were newspaper vendors, weaving their way in and out of traffic, that was stopped for the light. We then headed for the next town south: Jalisco (or Xalisco, in Spanish.) The highway there emptied onto the town square, with a beautiful tiled plaza to our right and a well-preserved park on our left. In front of the park was a booth, where one could buy children's toys. Facing the plaza was the city hall, decked out in a lovely shade of medium green. Across the street from the city hall was a huge yellow building, full of young people. According to the sign on the building, this was a technical high school. As we passed by, we heard a bell ring, and the sound of many students, chatting as they entered their classrooms. The corridors of the school were outside the building on the second and third floors, so we got to see all the hubbub, as well as hear it.

III. Horticulture:

Will return next issue.

IV. The Horticultural History of Calochorti

"Calochortus-Sensational Native American Tulips" by. Claude A. Barr [This article, originally written in 1939, was only published recently, in the Bulletin of the American Rock Garden Society. My thanks to Dr. R Werra for bringing it to my attention. -ed.]

In the Western half of our continent dwells a brilliant and versatile race of spring bulbs that are known and enjoyed but little outside their natural area. *Calochortus*, comprising the mariposa tulips and related groups popularly known as fairy lanterns or globe tulips and cat's ears or star tulips, are the instant delight and envy of every flower lover who sees them, whether as specimen groups in the

garden or in nature's lavish landscapes, where fifty thousands hold their shining cups stiffly erect to the sun and the breeze on a quarter mile slope...

Slight acquaintance does not compass the wonder of these flowers. But, believing, one demands, "Why are not these rare beauties in all our gardens?"...Though more than a hundred years have gone since David Douglas gathered the first of them for eager English experimenters and though 50 years or more some or many of the species have been on the market, still they remain the playthings of a few lucky or extremely clever gardeners who somehow meet their exacting requirements. Just what these are a steadily augmenting coterie of admirers is striving to know.

The usual final failure under the best available advice and care and their usual advent from California are the basis of the familiar assumption that these most desirable of all natives are not hardy. The generalization goes very wide of the mark. Those which have their origin in California include tender kinds from the southern coast that bear practically no frost to others that withstand fairly low temperatures, even light freezing during early growth if the all-important factors of soil and moisture are right.

In addition, a few high mountain sorts are quite hardy and--a fact not commonly dwelt upon--some twenty species are native outside the mild coast state or but touch its colored borders. While a few of these are Mexican, others, chiefly in the showy class and including some of the most outstanding and distinguished in form and beauty, are to be met with from northeastern California far into the intermountain dry belt of British Columbia and across Washington and Oregon, Idaho, Montana and Wyoming, two species extending onto the plains of the Dakotas and northwestern Nebraska and following the cold ranges of the Rockies far to the south.[Continued next issue].

V. Botany

[Instead of the usual feature highlighting one *Calochortus* species, we are printing an article by a graduate student in biology who is doing his doctoral work on *Calochortus* phylogeny. This concerns the genetic relationships and thereby the likely evolutionary history of the family. As we are not covering a new species, the color page will be used for one already covered: a good excuse to exhibit the color forms of *Calochortus venustus*. The species this issue feature will return in the future, after Mr. Patterson's entire article has been presented. -ed.]

Part I- The Phylogenetic Perspective

by Tom Patterson, doctoral candidate at the University of Wisconsin, Department of Botany

Calochortus is one of the most spectacular genera in North America, if not the world. With approximately 67 species distributed from British Columbia to Guatemala, *Calochortus* constitutes one of the largest plant genera endemic to western North America. It shows a kaleidoscopic range of floral colors and forms. Flowers range from large, open, tulip-like blossoms, to showy nodding globes, to bizarre forms with dense hairs on the inner surface of the petals; colors vary from white to yellow, pink, red orange, purple, brown and black. Different species can be found in an immense array of habitats ranging from grassy slopes, subalpine meadows, forest understories, chaparrals, deserts, vernal meadows, sage-brush communities, tropical lowlands; and on a diversity of unique soils including serpentine and gypsum outcrops. This level of species, floral and ecological diversity is rarely surpassed within a single genus. *Calochortus* therefore represents an outstanding group from which to learn about the evolutionary process, which is exactly why I decided to focus my PhD research on the genus.

I have frequently thought, seeing that I am interested in evolutionary biology, how great it would be to be able to travel back in time and observe the evolution of an interesting and diverse group of species, especially one like *Calochortus*. Just think of all the questions that could be answered and the new insights that would emerge. While time travel is of course impossible, recent technological advances do, amazingly, enable scientists to get pretty close. It is now possible to reconstruct evolutionary history by examining the evolutionary record inscribed in genetic material. So, rather than actually traveling back in time, we can, at least, peer into the past. The field of research involved in reconstructing evolutionary history is called phylogenetics and is the avenue that I am

taking in my study of *Calochortus*

Phylogenetics works on the principle that the history of evolution can accurately be represented in the form of a tree--the proverbial "tree of life." The history of life has, in fact, been a continuous process of branching much like the manner in which a tree grows. In the beginning there was a single species (a bacteria which first appeared approximately 3.5 billion years ago), which speciated (i.e. branched) to give rise to other species, which in turn gave rise to others, and so on through the eons. This first bacteria represents the trunk on the tree of life and the massive number of species we see today--the product of many years of branching--represent the twigs on the outermost branches. The goal of phylogenetics is to trace these branching patterns back in time to devise an evolutionary tree, that is, to reconstruct evolutionary history.

The genus *Calochortus* with its 67 or so species is only a small side branch on the immense tree-of-life. But, as the readers of *Mariposa* will agree, it is an extremely interesting branch nonetheless! Reconstructing the branch of *Calochortus* on life's evolutionary tree is the central goal of my PhD work. While this goal, being a representation of the genus's evolutionary past, is an important end in and of itself, there are important applications for phylogenies which I intend to employ on *Calochortus*. Many of these address extremely pertinent evolutionary questions that cannot be answered without a phylogeny. A few of these types of questions are presented below:

1). Where, geographically, did the genus first evolve? There are three probable regions in which *Calochortus* arose: the Pacific Northwest, Central Mexico and southern California. If the most primitive species in the genus is not known--which can only be determined with a phylogeny--then it is impossible to determine which, if any, of these regions is the correct birth place of the genus.

2). What have the patterns of *Calochortus* geographic migration been? *Calochorti's* lack of a prominent means of seed dispersal (e.g., species lack wings, fleshy fruits, etc.) suggests the genus might exhibit a high degree of "geographic cohesion." That is, it is likely that related species would be found in the same geographic areas simply because they do not have a means to disperse elsewhere. For this hypothesis to be supported, the geographic position of each species must be correlated with its position on the overall phylogeny.

3). Are similarities in species morphology due to common ancestry or parallel evolution? Species may have similar characteristics because they are closely related and inherited them from a common ancestor (and have not diverged from each other since their respective origins) or because they have evolved similar adaptations independently in response to similar environmental challenges (parallel evolution). The only way to tease apart these two potential causal factors is to overlay species morphological characteristics onto a phylogeny and examine where species with similar features fall in relation to each other.

4). How many times have the various floral forms such as fairy lantern, cat's ear, mariposa, etc. evolved within the genus? For example, there are species with the cat's ear type flowers found in the Pacific Northwest (species in subsection *Elegant*) and central Mexico (e.g. *C. ownbeyi*, *C. ghiesbreghtii*, etc.) but not in between. It is possible that the cat's ear floral form is ancestral to the genus as a whole and therefore arose only once in *Calochortus* or that it arose once in either Mexico or the Pacific Northwest, and that a species, despite being 3000 miles away, was able to disperse to one or the other geographic region, respectively. However, it seems more probable that the cat's ear type flower arose at least twice within the genus, once in Mexico and once in the Pacific Northwest. Although logically compelling, the latter hypothesis is just speculation until a phylogeny of *Calochortus* is completed.

5). Finally, have ecological shifts been frequent or rare within *Calochortus*? For example, species in one particular habitat could, in general, give rise to others in the same or very similar habitats (e.g. desert to desert, or sage brush to desert). Or, shifts from one type of habitat to another could have been frequent and abrupt, as in a case, for example, where a desert species gave rise to a forest understory species. The former scenario suggests that *Calochortus* is not very ecologically labile, [i.e. changeable-ed.], whereas the latter suggests the opposite. By overlaying species' habitat preference onto the phylogeny of *Calochortus* it will be possible to discern the actual patterns of ecological

diversification w/thin the genus. [Continued next issue]. [All photos on p. 5 taken by H.P. McDonald]



C. vonustus