



LEAFLETS
OF
WESTERN BOTANY

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of
WESTERN BOTANY

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RECENT ADDITIONS TO THE KNOWN FLORA OF ARIZONA

BY THOMAS H. KEARNEY, ELIZABETH MCCLINTOCK

AND KITTIE F. PARKER

California Academy of Sciences; University of Arizona

"Arizona Flora"¹ was published in September, 1951. In the little more than a year that has since elapsed, some 15 species have been added to the recorded flora. Among them are representatives of 4 genera not known previously as occurring in Arizona, *Beckmannia*, *Fumaria*, *Pholisma*, and *Cordia*. The additions have resulted from extensive collections by the junior authors of this paper, as well as by Chester F. Deaver of Arizona State College at Flagstaff, Rose E. Collom of the Grand Canyon National Park Herbarium, Walter S. Phillips of the University of Arizona, Gale Monson of the Havasu Lake Refuge of the U. S. Fish and Wildlife Service, and others. Thanks to these collections, the geographical and altitudinal ranges of many species have been extended. The exploration, in 1952, of Grand Canyon National Monument by Elizabeth McClintock, accompanied by Dr. and Mrs. Walter P. Cottam, resulted in the inclusion of Mohave County in the geographical distribution of numerous Arizona plants.

The limits of this article do not allow mention of these extensions of range, except for a few of the rarer species. Nor is it practicable to discuss here the numerous corrections and modifications of the keys necessitated by the information now available. Fortunately, most of these are of a very minor character.²

ADDITIONAL GENERA AND SPECIES

BECKMANNIA. A genus, new to Arizona, which should come next to *Spartina* in the key to the genera of *Gramineae* (p. 73, paragraph 61). It differs from the latter in having broad, boat-shaped glumes of equal length, whereas in *Spartina* the glumes are narrow and unequal. *Beckmannia syzigachne* (Steud.) Fern., widely distributed in North America and Asia, was collected

¹Arizona Flora, by Thomas H. Kearney, Robert H. Peebles, and Collaborators, University of California Press, 1951. (1032 pages, 33 plates, 1 map).

²The page references, in parenthesis, are to "Arizona Flora," unless noted otherwise. Leaflets of Western Botany, Vol. VII, pp. 1-16, February 28, 1953.

in 1951 at Greenland Lake, on the North Rim of Grand Canyon, at an elevation of 8500 feet (*Merkle 411*).³

ERIOGONUM PARISHII Wats. was found at Crown King, Yavapai County, elevation 6000 feet (*A. Beaty in 1951*). In the key to the species of *Eriogonum* (p. 232), it would appear immediately after second paragraph 19, differing from *E. pusillum* and *E. reniforme* in having the basal leaves hirsute, not white-lanate, beneath. In second paragraph 13 of the key the words "(except in *E. Parishii*)" should be inserted after "Leaves." This species was known previously only from southern California and Baja California.

FUMARIA. This genus of *Papaveraceae*, subfamily *Fumarioideae*, differs from *Corydalis* (see key to the genera p. 322, first paragraph 1) in having globose, 1-seeded, indehiscent fruits and whitish or purplish, crimson-tipped corollas. *Fumaria parviflora* Lam., a Eurasian species sparingly naturalized in California, was discovered recently in waste land at Tucson, Pima County (*K. F. Parker 8016*).

MATTHIOLA BICORNIS (Sibth. & Smith) DC. was noted in Arizona Flora (p. 354) as having disappeared from the mesas near Tucson, but it is still common there and has been collected also near Holbrook, Navajo County. In the key to the genera of *Cruciferae* (p. 327), *Matthiola* would appear next to *Chorispora* (first paragraph 16), differing from that genus in having the herbage pubescent with forked or stellate hairs (glandular hairs few or none), and capsules with a much shorter beak, this bifurcate at apex and the body not or scarcely torulose.

ASTRAGALUS COCCINEUS Brandeg. This very handsome plant of the section *Argophylli*, known previously only from southern California, has been collected in the Kofa Mountains, Yuma County, on sandy slopes at an elevation of about 3000 feet (*H. B. Crandall in 1952*). In the key to the species of *Astragalus* (p. 447), it would be entered next to *A. Newberryi* (first paragraph 20), having densely silky-villous pods; but it differs from that and all other North American species of *Astragalus* in the brilliant scarlet color of the very large corollas (35 to 40 mm. long).

³See Madroño 12:32 (1953).

CALLITRICHE. Norman C. Fassett, in his revision of the New World species of this genus (*Rhodora* 53: 137-222), recognized two species as occurring in Arizona, *C. heterophylla* Pursh (emend. Darby) and *C. verna* L. (emend. Kütz.). The latter, which is the *C. palustris* of Arizona Flora (p. 521), was distinguished by Fassett as having the fruits distinctly longer than wide, with carpels winged at apex, whereas, in *C. heterophylla*, the fruits are not or but slightly longer than wide and the carpels are not winged or very obscurely so. A collection in northern Gila County (*Peebles & Smith 13296*) was referred to *C. heterophylla* var. *heterophylla* by Fassett (ibid. p. 176), and the Eastwood collection in Sabino Canyon, Pima County, mentioned in Arizona Flora, apparently also belongs there. Fassett cited no Arizona specimens of *C. heterophylla* var. *Bolanderi* (Hegelm.) Fassett. He mentioned (ibid. p. 171) two Arizona collections of *C. verna*, at Flagstaff (*Greene in 1889*), and at Tucson (*Lemmon in 1881*).

ABUTILON PARISHII Wats. In Arizona Flora (p. 539) this species was erroneously reduced to synonymy under *A. Palmeri* Gray, from which it is amply distinct, in having corollas only about 10 mm. long (15-25 mm. in *A. Palmeri*), a more paniculate inflorescence, strongly discolored and usually more acuminate leaves, and the longer stem-hairs mostly reflexed. In addition to the type-collections in the Santa Catalina Mountains (*Parish, Pringle*, in 1884) it was collected in the same mountains by Lemmon in 1883, and by Eastwood (*No. 17736*); also in the Mazatzal Mountains, Gila County (*Eastwood 17497*). The species is known only from these Arizona localities.

SIDA RHOMBIFOLIA L. Bear Valley (Sycamore Canyon), Santa Cruz County, 3500 feet, rocky slopes (*Darrow & Haskell 2223*), noted by the collectors as a shrub 6 feet tall. This species is widely distributed in the warmer parts of both hemispheres, but it had not been reported previously from Arizona. In the key to the species of *Sida* (p. 550) it would be placed between *S. spinosa* and *S. tragiaefolia* (paragraph 6), differing from the former in being perennial and having more numerous carpels (10 or more, as compared with 5 in *S. spinosa*). From *S. tragiaefolia*, which also has fruits with 10 or more carpels, *S. rhombi-*

folia differs in the rhombic-cuneate leaves, these more finely dentate or serrate.

OENOTHERA PTEROSPERMA Wats. This species of subgenus *Chylismia*, known previously from southern Utah to eastern Oregon and southeastern California, was collected in Grand Canyon National Monument, northeastern Mohave County, at elevations of 4500 to 5000 feet (*McClintock* 52-173, 256, 382a). In the key to the species of *Oenothera* (p. 595) it would be entered under second paragraph 26, preceding first paragraph 32. It is a small, delicate annual, distinguished from all the other species of subgenus *Chylismia* by the winged seeds and flowers solitary in the axils, not in racemes or panicles. The pinkish petals are barely 2 mm. long.

PHOLISMA ARENARIUM Nutt. Another genus was added to our flora with the finding of this curious parasitic plant on sand dunes near Parker, Mohave County, by Mrs. Hugh Cowan. Our attention was called to this discovery by Gale Monson, Superintendent of the Havasu Lake Wildlife Refuge. This plant belongs to the small family *Lennoaceae* (p. 629), differing from *Ammobroma* in having the flowers in a dense, ovoid or cylindrical, sometimes branched spike, instead of a saucer-shaped head, and in having glabrous, linear sepals (these plumose and filiform in *Ammobroma*). *Pholisma arenarium* was known previously only from southern California and Baja California.

FRAXINUS (pp. 641, 642). Elbert L. Little, Jr., in a paper entitled "Notes on Fraxinus (Ash) in the United States" (*Jour. Wash. Acad. Sci.* 42:369-380, 1952) has described a new species, *F. Gooddingii* Little (*ibid.*, p. 373), designating as the holotype a specimen collected in Bear Valley (Sycamore Canyon), Santa Cruz County, Arizona, by L. N. Goodding in 1936. In *Arizona Flora* this collection was cited under *F. Greggii* Gray (species no. 4). The present writers agree that the Arizona plants are specifically distinct. Little cited several other collections of *F. Gooddingii* from Santa Cruz County and one from northeastern Sonora.

Specimens (5 collections) from the Chiricahua, Huachuca, and Santa Rita mountains were referred by Little (*ibid.*, p. 378) to *F. papillosa* Lingelsh. This species had been recognized by

Alfred Rehder (Proc. Amer. Acad. 53:200, 210) but he did not include Arizona in its range. It is distinguished from *F. velutina* Torr. (*F. Standleyi* Rehder) by the minutely papillose, whitish or glaucous lower surface of the leaflets.

Little (ibid., p. 370) reduced *F. Lowellii* Sarg. (species no. 2 in Arizona Flora) to varietal status as *F. anomala* Torr. var. *Lowellii* (Sarg.) Little. The present writers reserve judgment as to whether this reduction is justified.

ERRATUM

Please replace line 15, page 4, Vol. VII, No. 1, *Leaflets of Western Botany* with this gummed label

by a collection in Greenlee County (*Maguire et al. 11805*) and by one in Cochise County (*Blumer 1796*), occurring also in western Texas and northeastern Mexico. The range of *L. viride* as given by Johnston is Texas to Arizona and northeastern Mexico, but he cited no collections in our state. He informs us, however, that this plant has been collected in Guadalupe Canyon, in the southwestern corner of New Mexico, so its occurrence in southeastern Arizona is very probable. The following key to the five Arizona species is abstracted, with slight modification, from Johnston's key (ibid. pp. 317-320):

1. Flowers (the showy ones) heterostylic or dimorphic, the 2 types of flowers differing in the height at which the stamens are affixed in the corolla-tube. Cleistogamous flowers usually wanting (2).

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Cordia parvifolia A. DC. (*C. Greggii* Torr.) represents a fourth genus new to the known flora of Arizona. The identification was confirmed by Ivan M. Johnston. In the key to the genera of *Boraginaceae* (p. 707), *Cordia* belongs with *Coldenia* under first paragraph 1, having a cleft style and distinct stigmas; but in *Cordia* the style is twice cleft, with 4 branches and stigmas. Also *C. parvifolia* is a much larger shrub than any of the species of *Coldenia*, with much larger, white corollas, and the fruit is drupaceous. Only a single plant is known in Arizona, discovered by C. F. Altfillisch in 1951, on a gravel ridge among *Larrea* bushes, about 17 miles south of Tucson, Pima County. It is an old, many-stemmed shrub about 6 feet high. There is no evidence that it had been planted at this station.

LITHOSPERMUM. In his recently published Survey of the Genus *Lithospermum* (Jour. Arnold Arboretum 33:299-366), Ivan M. Johnston assigned 5 species to Arizona, *L. confine* Johnst. and *L. viride* Greene having been added to the 3 species in Arizona Flora (p. 724). *Lithospermum confine* is represented by a collection in Greenlee County (*Maguire et al. 11805*) and by one in Cochise County (*Blumer 1796*), occurring also in western Texas and northeastern Mexico. The range of *L. viride* as given by Johnston is Texas to Arizona and northeastern Mexico, but he cited no collections in our state. He informs us, however, that this plant has been collected in Guadalupe Canyon, in the southwestern corner of New Mexico, so its occurrence in southeastern Arizona is very probable. The following key to the five Arizona species is abstracted, with slight modification, from Johnston's key (ibid. pp. 317-320):

1. Flowers (the showy ones) heterostylic or dimorphic, the 2 types of flowers differing in the height at which the stamens are affixed in the corolla-tube. Cleistogamous flowers usually wanting (2).

1. Flowers (the showy ones) not heterostylic, monomorphic (3).
2. Stems not arising from a leaf-rosette, the lower cauline leaves very much smaller than the middle and upper ones; corolla-tube glabrous within
.....*L. multiflorum*
2. Stems arising from a well-developed leaf-rosette, the basal leaves much larger than the middle and upper cauline ones; corolla-tube hairy within, at least in the long-styled flowers.....*L. cobrense*
3. Pollen ellipsoidal or subglobose; cleistogamous flowers absent; stem-leaves 10-35 mm. wide, evidently veined. Corolla yellow or yellowish, with entire, spreading or recurved lobes.....*L. viride*
3. Pollen perfectly globose; cleistogamous flowers always present; stem-leaves not more, usually less than 10 mm. wide, obscurely veined (4).
4. Corolla-lobes erose or fimbriate; fruiting calyx usually nutant or cernuous; cleistogamous flowers abundant.....*L. incisum*
4. Corolla-lobes entire; fruiting calyx erect; flowers commonly nearly all cleistogamous.....*L. confine*

STACHYS AGRARIA Cham. & Schlecht. This species, previously known only from Texas, Mexico, and Guatemala, was collected by Verl Rhoton in 1950, in the region of McNary and Lakeside (southern Apache and Navajo counties), the precise locality not recorded. Dr. Carl Epling, who identified the specimen, commented: "It is the relatively broad-leaved form of this widely distributed species which M. E. Jones called *S. camporum*." It differs from the other species of *Stachys* in Arizona (see key p. 739) in having much smaller flowers, the corolla-tube being not more than 4 mm. long. The verticillasters are very numerous, 6-12-flowered.

LINARIA DALMATICA Mill. was found by Kittie F. Parker, growing without cultivation on the campus of Arizona State College, at Flagstaff. It is a handsome plant from the Mediterranean region, sometimes grown in flower gardens. Doubtless it was merely a casual escape, so the species cannot yet be included in the flora of Arizona. The flowers are yellow, but this species differs from *L. vulgaris* (see key p. 764) in having broader, ovate or ovate-lanceolate, cordate-clasping leaves and much larger flowers, the corolla 3.5-4 cm. long.

ANTIRRHINUM KINGII Wats. (see p. 766) is now definitely a member of the Arizona flora, specimens of var. *Kingii* having been obtained in Toroweap Valley and the inner gorge of the

Colorado River on cinder soil at about 4500 feet elevation (*McClintock* 52-424, 556). Var. *Watsoni* (Vasey & Rose) Munz, which differs from the typical variety in its longer pedicels and larger calyx, has been collected in northwestern Sonora and may be looked for in southwestern Arizona.

MIMULUS TILINGI Regel. A collection on "Smith Creek," presumably Smith Spring on the San Francisco Peaks, *Leiberg* 5721, was referred to this species by Gloria R. Campbell (El Aliso 2:324). The characters she gave for distinguishing this species from *M. guttatus* (Arizona Flora p. 781) seem not very clear cut, however. Campbell (*ibid.* p. 331) referred several collections of *M. guttatus* in Arizona to var. *gracilis* (Gray) Campbell, the variety being characterized by recurved pedicels, commonly geniculate stems, and frequently scorpioid young inflorescences.

NEMACLADUS GRACILIS Eastw. Recorded (p. 827) as a doubtful member of the Arizona flora, this *Nemacladus* may now be included without reservation. It was collected in 1947 near Yucca, western Mohave County, in the Joshua Tree association, at an elevation of 2300 feet (*Gould & Darrow* 4311, part, and 4312). The specimens were identified by G. T. Robbins.

PSATHYROTES ANNUA (Nutt.) Gray. Specimens collected in Toroweap Valley, northeastern Mohave County, 4000 to 5000 feet (*McClintock* 52-589a, *Cottam* 13340) established this species as a component of the Arizona flora (see p. 943).

CIRSIUM RYDBERGII Petrak has been collected on Black Mesa, northern Apache County, 6000 feet (*Deaver* 3675). Previously the species was known only by a few collections in southeastern Utah. In the key to *Cirsium* (p. 951), it comes nearest to *C. bipinnatum* (second paragraph 7), differing in the glabrous or glabrescent herbage, rounded and clasping leaf-bases, and outer phyllaries appressed or ascending (widely spreading or deflexed in *C. bipinnatum*).

CIRSIUM VULGARE (Savi) Airy-Shaw. The occurrence of this species in Havasu Canyon, western Coconino County (see p. 954), was confirmed by the collection by Nina Eloesser of specimens in a more advanced stage of growth, although still without heads.

REVISED IDENTIFICATIONS

Portulaca coronata Small (p. 291) is a synonym of *P. umbraticola* H.B.K., according to Legrand (Comunic. Bot. Mus. Hist. Nat. Montevideo 2 (24):2). According to that author the species ranges from the southern U.S.A. to Argentina.

Arenaria confusa Rydb. and *A. saxosa* Gray (pages 296, 297) have been reduced to synonymy under *A. lanuginosa* (Michx.) Rohrb. subsp. *saxosa* (Gray) Maguire, in a recent paper by Bassett Maguire (Amer. Midl. Nat. 46:493-511, see p. 498).

Prunus virens (Woot. & Standl.) Shreve (p. 394) was reduced to a subspecies of *P. serotina* Ehrh. in a revision of this group by Rogers McVaugh (Brittonia 7:279-315). Two varieties of the subspecies, var. *virens* and var. *rufula* (Woot. & Standl.) McVaugh were distinguished, the latter confined in Arizona to the region south of the Gila River.

Astragalus didymocarpus Hook. & Arn. var. *dispermus* (Gray) Jeps. (p. 469). *Astragalus dispemus* Gray was restored to specific rank by Lois E. James in her revision of subgenus *Hesperastragalus* (Contrib. Dudley Herbarium 4:67), although Barneby (El Aliso 2:212) preferred the varietal status.

Bacopa rotundifolia (Michx.) Wettst. (p. 783). The correct name of the Arizona plant probably is *B. Eisenii* (Kellogg) Pennell (Proc. Acad. Nat. Sci. Phila. 98:96), *B. rotundifolia* apparently being limited to the eastern and central United States. *Bacopa Eisenii* is known otherwise only from Nevada and central California.

Plantago eriopoda Torr. (p. 804). The Arizona plants previously referred to this species are certainly nearer *P. Tweedyi* Gray and should be placed there provisionally, although not quite typical of that species either.

Galium Watsoni (Gray) Heller. This species apparently does not occur in Arizona, the plants referred to it in Arizona Flora (p. 811) representing a glabrous form of *G. Munzii* Hilend & Howell according to Dr. F. Ehrendorfer (personal communication).

Valeriana (pp. 818-820). Frederick G. Meyer in a recent revision of the North American valerians (Ann. Mo. Bot. Gard. 38:377-503) treated the species occurring in Arizona as follows: *V. edulis* is represented by subsp. *edulis*; *V. sorbifolia* is repre-

sented by var. *sorbifolia*; *V. arizona* the most widely distributed and abundant species, has, as a synonym, according to Meyer, *V. ovata* Rydb.; *V. acutiloba* becomes *V. capitata* Pall. subsp. *acutiloba* (Rydb.) F. G. Meyer; *V. occidentalis* Heller retains its specific status but only one Arizona collection (*Collom 1056*) was cited by Meyer.

Pinaropappus roseus Less. (p. 962). Lloyd H. Shinnars (Field and Laboratory 19:48) referred all Arizona specimens to var. *foliosus* Shinnars, type from the Chiricahua Mountains (*Blumer 1571*). He characterized the variety as having the stems leafy to above the middle and leaves up to 12 cm. long. Typical *P. roseus*, according to Shinnars, occurs only east of the Continental Divide.

NEW RECORDS OF RARE TAXA

Phalaris canariensis L. (p. 131). Tucson, Pima County (*K. F. Parker 8028*).

Carex oreocharis Holm (p. 162). Escudilla Mountain, Apache County, 9500 feet (*Parker & McClintock 7598*, det. J. T. Howell).

Carex curatorum Stacey (p. 162). Near Toroweap Point, northeastern Mohave County (*McClintock 52-539*, det. J. T. Howell).

Pistia Stratiotes L. (p. 165). This plant was reported by Mrs. Charlotte Reeder in 1944 as having become so abundant in irrigation canals in Yuma County as to constitute a nuisance.

Tillandsia recurvata L. (p. 166). Galiuro Mountains, Graham County, 4000 feet, growing on a fallen log (*V. Ramsdell in 1951*).

Polygonum ramosissimum Michx. (p. 248). Near Ganado, Apache County, 7500 feet (*Deaver 4100*).

Atriplex elegans (Moq.) D. Dietr. var. *Thornberi* Jones (p. 258). This variety also occurs in Santa Cruz County (*A. Henson 163a*).

Stellaria longifolia Muhl. (p. 293). Reported by Dr. F. W. Gould from the Sierra Ancha, Gila County (*No. 3802*).

Delphinium tenuisectum Greene var. *amplibracteatum* (Wooton) Ewan (p. 310). Escudilla Mountain, Apache County (*Parker & McClintock 7552*).

Astragalus amphioxys Gray var. *vespertinus* Sheldon (p. 458). Kanab Plateau, northeastern Mohave County (*McClintock 52-502*).

Astragalus albulus Woot. & Standl. (p. 461). Richville Valley, Apache County (*Richey in 1950*); Black Mesa, Apache County (*Deaver 3914*); Black Mountain, Navajo County (*Deaver 3882*).

Geranium lentum Woot. & Standl. (p. 485). Near Sprucedale, Greenlee County, 7500 feet (*Parker & McClintock 7644*). In this collection the petals were reflexed and of a pale lavender color.

Croton ciliato-glandulosus Ortega (p. 504). Collected at the locality mentioned in Arizona Flora also by Dr. Walter S. Phillips (*No. 3468*).

Elatine americana (Pursh) Arn. (p. 557). North Rim of Grand Canyon (*Collom 2778*).

Petalonyx nitidus Wats. (p. 564). A second collection of this species in Arizona was made in 1952 on Vulcan's Throne, north-eastern Mohave County, 4500 feet (*Cottam 13,345*).

Oxypolis Fendleri (Gray) Heller (p. 621). Escudilla Mountain, Apache County, 8500 feet (*Parker & McClintock 7481*).

Gilia filiformis Parry (p. 690). Toroweap Valley and Colorado River Canyon, northeastern Mohave County, up to 4500 feet (*McClintock 52-199, 546*).

Phacelia demissa Gray (p. 701). Between Piñon and Salina and on Black Mountain, Navajo County, about 6500 feet (*Deaver 3485, 3881*, det. J. T. Howell).

Phacelia glechomaefolia Gray (p. 701). Grand Canyon National Monument, Mohave County (*McClintock 52-163, 279, 346*, det. J. T. Howell). By far the finest material of this handsome species that has been collected.

Phacelia neomexicana Thurber var. *alba* (Rydb.) Brand (p. 704). Escudilla Mountain, Apache County, 8500 feet (*Parker & McClintock 7635*).

Tricardia Watsoni Torr. (p. 706). Grand Canyon National Monument, northeastern Mohave County, 4000-5000 feet (*McClintock 52-323, 474*).

Cryptantha recurvata Coville (p. 719). Grand Canyon National Monument, 4500 feet (*McClintock 52-420*).

Molucella laevis L. (p. 739). Benson, Cochise County (*Grant-ham in 1951*).

Scrophularia californica Cham. (p. 767). Blue Mountains, Greenlee County, 10,000 feet (*Parker & McClintock 7661*).

Limosella aquatica L. (p. 783). Buggeln Ranch, South Rim of

Grand Canyon, Coconino County (*Collom 2378*).

Castilleja lineata Greene (p. 788). Escudilla Mountain, Apache County (*Parker & McClintock 7499*).

Solidago graminea (Woot. & Standl.) Blake (p. 858). Black Mesa, Navajo County (*Deaver 3715*); between Tuba and Oraibi, Coconino County (*Deaver 3763*).

Achaetogeron chihuahuensis Larsen (p. 867). Escudilla Mountain, Apache County (*Parker & McClintock 7628*).

Ratibida Tagetes (James) Barnhart (p. 899). Ganado Dam, Apache County (*Deaver 3991*).

Helianthus Nuttallii Torr. & Gray (p. 903). Escudilla Mountain, Apache County (*Parker & McClintock 7632*).

Achillea lanulosa Nutt. var. *alpicola* Rydb. (p. 936). Escudilla Mountain, Apache County (*Parker & McClintock 7615*).

Euryops multifidus (L. f.) DC. (p. 950). Near Safford, Graham County (*Montierth in 1952*), where it was an escape from plantings by the U. S. Soil Conservation Service and bids fair to become naturalized, as in the Tucson area.

Centaurea solstitialis L. (p. 955). Waste places and lawns at Tucson, Pima County (*K. F. Parker 7463*).

SOME PLACES WHERE PHACELIAS GROW

BY JOHN THOMAS HOWELL

Although my 1952 field trip through Oregon and Washington was planned primarily for the study of thistles, I also hoped to find certain annual species of *Phacelia* about which I had written but which I had never seen growing. Of the five I hoped to discover, I found only three: *P. Greenei* J. T. Howell, *P. Peckii* J. T. Howell, and *P. verna* Howell. Along the road to Hat Point on the rim of the Grand Canyon of the Snake River I expected to find *P. minutissima* Henderson, since it was known in Idaho across the canyon to the east and in the Wallowa Mts. in Oregon to the west, but diligent search in several likely habitats did not discover it. The second species I failed to find was *P. Leibergii* Brand, an attractive plant which I was all-too-certain I would collect on the sagebrush flats or alkali dunes in southeastern Oregon where it has been collected a number of

times by Prof. M. E. Peck; but all I could find in my brief three-day journey across that fascinating region was the related, small-flowered *P. glandulifera* Piper. The three phacelias I did find, however, were the ones I wanted especially, not only because so little has been written of the places where they grow, but also because, until now, *P. Greenei* and *P. verna* have not been represented in the herbarium of the California Academy of Sciences.

PHACELIA GREENEI

Although the locality datum accompanying the type of *P. Greenei* in the Gray Herbarium is given as near Yreka, California, the locality named on the isotype in the Greene Herbarium specifies Scott Valley. It was on the east side of Scott Valley, Siskiyou County, where I first found the plant on June 14, and later on the same day, I made a second collection along the road between Callahan and Gazelle, also in Siskiyou County (*Howell 28340, 28351*). At both places the plants were locally common but were restricted to a thin gravelly scree overlying open serpentine slopes. The herbaceous parts of the phacelia were glandular and the secretion was distinctly malodorous. The corollas, which are rotate-campanulate or saucer-shaped, were a deep purple-violet except for the white center.

The first station, which could be the type-locality of the species, was about 9.5 miles from Fort Jones on the road to Callahan at an elevation of about 2800 feet. The common woody plants in the vicinity of the serpentine barren were *Pinus ponderosa*, *Juniperus occidentalis*, and *Ceanothus cuneatus*, and, among the herbaceous plants associated with the phacelia, the following were collected or noted: *Festuca reflexa*, *Scribneria Bolanderi*, *Sitanion jubatum*, *Stellaria nitens*, *Arabis subpinnatifida*, *Epilobium minutum*, *Androsace elongata* subsp. *acuta*, *Cryptantha flaccida*, *Crocidium nudicaule*, *Lagophylla ramosissima*, *Lessingia nemaclada* var. *mendocina*, and *Madia exigua*. At the second station, about 7 miles from Callahan on the road to Gazelle at an elevation of about 3700 feet, *Quercus Garryana* occurred in the nearby pine-juniper woodland, and among the annual and perennial herbs the following may be listed: *Onychium densum*, *Agropyron saxicola*, *Stipa Thurberiana*, *Eriogonum ovalifolium*, *E. vimineum*, *Polygonum majus*, *Lewisia rediviva*, *Arenaria Douglasii*, *Cryptantha trifurca*, *Penstemon*

parvulus, and *Eriophyllum lanatum* var. *achillaeoides*.

The finding of *P. Greenei* on two serpentine slopes in the Klamath area of northwestern California leads one to expect its discovery in still other similar places which are to be found in the petrologically and geologically complex mountains of that region.

PHACELIA PECKII

The Oregon highway, which extends westerly from Klamath Falls to Ashland, traverses a fine coniferous forest interspersed by a series of beautiful flowery meadows. Just before the road begins its long winding descent into the valley where Ashland is situated, it crosses the 4500-foot summit of Green Spring Mountain. Here, on July 8, in a forest of yellow pine, Douglas fir, and incense cedar, on a gentle open meadowy slope, I saw and collected *Phacelia Peckii* for the first time (*Howell* 28772). The little herb grew in heavy clay soil mixed with basalt fragments and was locally restricted to the low middle part of the meadow where water had seeped longest. The stems and leaves were glandular but not at all odorous. The corollas were an attractive lavender-blue, becoming nearly white in the center, and were so shallowly saucer-shaped as to be almost flatly rotate. Among the numerous annual herbs that grew in the meadow with the phacelia, the following may be noted: *Bromus racemosus*, *Deschampsia danthonioides*, *Polygonum sawatchense*, *Lotus Purshianus*, *Gilia capillaris*, *Navarretia intertexta*, *Nemophila pedunculata*, and *Madia gracilis*.

The sight of these living specimens of *P. Peckii* in Jackson County, Oregon, less than a month after making my field acquaintance with *P. Greenei* in Siskiyou County, California, reminded me of the apparent relationship between the two as evidenced by a similarity in habit and in the broadly rotate corollas (cf. Amer. Midl. Nat. 30:18; Leaf. West. Bot. 4:26). The adequate morphologic differences between the two have already been pointed out; now can be added their differentiating physiologic and ecologic peculiarities which can be learned only from field observation. In the paragraphs above I have described the malodorous character of the glandular secretion of *P. Greenei* and recorded the apparent preference of that species for sterile serpentine gravels. In contrast, *P. Peckii* is

much less distinguished in both its choice of habitat and character of glands; but, although its glandular secretion does not possess the biological interest of being offensive, this physiologic lack really adds to the over-all attractiveness of one of Oregon's most interesting endemics.

PHACELIA VERNA

Many people, impressed by the volcanic character of the Cascade Range and recalling the lava escarpments of the Columbia Plateau east of the mountains, regard the chocolate-brown or blackish bluffs of the Umpqua River Valley in Douglas County, Oregon, as basaltic in character. These massive outcrops, however, are sedimentary in origin and consist of water-deposited sands and gravels of Eocene age. It is on the open faces of these steeply sloping or vertical bluffs where *Phacelia verna* grows.

I almost did not find this rare plant. Search of the bluffs near Canyonville, Roseburg, and Wilbur on three different days failed to disclose even the summer-dried remains of the ephemeral vernal herb. Disappointed that so desirable a plant should have eluded me, I finally left Roseburg July 10 on my return trip to California, traveling westward toward the Oregon coast. Near Tenmile, about 15 miles southwest of Roseburg, some of the Eocene cliffs again beckoned. This time, my scramble up the steep slopes was crowned with success. The plants had matured and dried but they still carried ripe capsules and seeds. Not only had I found the elusive phacelia, but I had found it at a station new for the species!

The rock face on which my treasure dwelt had a southwestern exposure, and adjacent, soil-covered slopes that were less steep supported an open woodland of Douglas fir, Garry oak, bigleaf maple, and madroño. The phacelia did not even deign to grow in the thin fringe of soil at the edge of the rock surface but restricted itself to mossy cushions of *Rhacomitrium canescens* and *Selaginella Wallacei* which formed low mounds and narrow shelves on the nearly vertical open rock face. Everything was dry now, but it was evident that water had seeped or trickled down the rocks during the rainy season. A few other herbs, also desiccated, were noted as venturing into this highly specialized habitat: *Festuca dertonensis*, *Trifolium microdon*, *Mimulus guttatus*, *Plantago erecta*, and *Micropus californicus*; but only

the money-flower seemed to be truly at home with the phacelia.

But what a home for a phacelia! Whatever could have happened in eons past to strand this little herb, so far from kith and kin, on the Eocene bluffs of the Umpqua!

A NEW SISYMBRIUM FROM ARIZONA

BY REED C. ROLLINS

Gray Herbarium, Harvard University

The generic line between *Sisymbrium* and *Thelypodium*, so far as the American species are concerned, was somewhat altered by Payson^{1, 2}, who treated these genera monographically about twenty years ago. A number of species previously referred to *Thelypodium*, such as *T. elegans*, *T. aureum*, etc., were transferred to *Sisymbrium*. Later Schulz³ similarly shifted the Mexican *T. versicolor* and *T. Purpusii* of Brandege to *Sisymbrium*. Whether these are the ultimate rearrangements required to place the species of these genera into their proper relationships cannot be properly judged without a very comprehensive study and a much larger amount of data than is at present available. However, the plant with which we have to deal is most closely related to *Sisymbrium Purpusii* and on that basis it seems logical at this time to place it in *Sisymbrium*, following the lead of Payson and of Schulz. I take pleasure in dedicating it to Dr. T. H. Kearney, veteran of the flora of Arizona. My thanks are due Miss Elizabeth McClintock of the California Academy of Sciences for sending the specimens.

Sisymbrium Kearneyi Rollins, spec. nov. Herba annua; caulibus erectis, glabris, ramosis, 3-5 dm. altis; foliis radicalibus petiolatis pinnatifidis glabris; foliis caulinis amplexicaulibus pinnatifidis vel integris glabris; sepalis glabris; petalis albis vel roseo-albis; pedicellis fructiferis divaricatis glabris 4-6 mm. longis; siliquis tenuibus teretibus 4.5-5.5 cm. longis, circa 0.75 mm. latis; stylis circa 1 mm. longis; stigmatibus integris; seminibus oblongis immaturis.

~~Perennial~~ ^{Annual} herb, glabrous throughout, glaucous; stem single from base, divaricately branched, beginning near base, with each branch producing an inflorescence, 3-5 dm. high; basal leaves petiolate, dentate to pinnately lobed, 2-10 cm. long, 8-20 mm. wide, mostly oblong in outline, varying greatly in

¹University of Wyoming Publications in Science 1:1-27 (1922).

²Ann. Mo. Bot. Gard. 9:233-324 (1923).

³Das Pflanzenreich IV. 105:57-58 (1924).

size and shape; lowermost cauline leaves petiolate and pinnately lobed, similar to adjacent basal leaves, overlapping, gradually becoming sessile, auriculate and entire above, the upper being sagittate, clasping and progressively reduced up the stem; pedicels (in fruit) slender, straight, divaricately ascending, 4-6 mm. long; sepals hyaline-margined, narrowly oblong, non-saccate, 4-5 mm. long, 1-1.5 mm. wide; petals nearly white, becoming light purplish upon drying, spatulate, gradually narrowed from apex to base, 6-8 mm. long, 2-2.5 mm. wide; stamens erect, filaments of uniform diameter from base to apex, those of paired stamens about 5 mm. long, anthers oblong, 1-1.25 mm. long; pollen tricolpate, $26 \times 17.5\mu$; glandular tissue continuous around the receptacle, subtending filaments of paired stamens and surrounding filaments of single stamens; siliques sessile or nearly so, terete, slender, divaricately ascending, nearly straight, 4.5-5.5 cm. long, about 0.75 mm. in diameter, valves nerved from base to apex; styles thick, only slightly less in diameter than the siliques, about 1 mm. long; stigma entire; seeds oblong, wingless, immature.

Type in the Gray Herbarium, collected along trail into S. B. Canyon, Grand Canyon National Monument, Arizona, May 8, 1952, *Elizabeth McClintock 481a*. Another collection (in flower) from the same locality but found growing under shelter of overhanging cliffs is *Elizabeth McClintock 52-481* (GH). Duplicates in Herb. Calif. Acad. Sci.

Superficially, in flower, plants of *S. Kearneyi* resemble some forms of *Caulanthus lasiophyllus*, but it can be readily distinguished by the slender ascending pedicels, lack of pubescence and glaucous appearance. As in many annual plants of desert areas that go through their life-cycles in a relatively short period, *S. Kearneyi* is quite variable as to size. On most of the flowering specimens, a transition from nearly entire small first-formed leaves can be traced through a series becoming larger and progressively more highly pinnatifid, then in the reverse direction toward entire and smaller sessile leaves as one proceeds up the stem of the plant. The lobes of the pinnatifid leaves are at right angles or may be somewhat reflexed. In the most highly divided, the incisions extend to the mid-axis of the leaf.

Although definitely related to *S. Purpusii*, our species differs in having broadly spatulate instead of linear petals, much larger flowers, and subclavate instead of tapering styles. *Sisymbrium Purpusii* is known only from the type-collection made in the Sierra Pata Galeana, Coahuila, Mexico.

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NOTES ON SPECIMENS OF AMERICAN
PLANTS IN EUROPEAN HERBARIA

BY ARTHUR CRONQUIST

New York Botanical Garden

During 1951 and 1952 I had the opportunity to examine a number of type-specimens of American plants (chiefly *Compositae*) at the British Museum of Natural History, the Royal Botanic Gardens at Kew, and the Muséum d'Histoire Naturelle at Paris. I am grateful to the curators and personnel of these institutions for their courtesy and helpfulness. In most instances the examination of the type merely confirmed the current application of the name. In a few cases, however, a change appears to be necessary.

Astragalus miser Dougl. ex Hook. (Fl. Bor. Am. 1: 153,—1831) was based on a Douglas collection from the "Spokane River, sixty miles from its confluence with the Columbia." The name has subsequently sometimes been applied to *A. microcystis* Gray and to *A. obscurus* Wats., the latter a more southern species, not otherwise known to occur within two hundred and fifty miles of the type-locality of *A. miser*. The improbability of the latter interpretation was pointed out to me by Dr. Marion Ownbey, and the type was accordingly examined when the opportunity arose. In publishing Douglas' description of *A. miser*, Hooker noted that he had not seen the specimen himself. The type was found at the British Museum. It proves to be a small specimen of what has recently been passing as *A. decumbens* var. *serotinus* (Gray) Jones. The specimen has linear, acute leaflets nearly 1 cm. long and about 1 mm. wide, the terminal one barely or scarcely articulate to the rachis. The herbage is rather thinly strigose. The specimen is merely in bud, but even in the absence of well-developed flowers and fruit there seems little likelihood of error in its determination. Although it approaches the more southern *A. decumbens* var. *decumbens* in appearance, it is less rigid than that variety, and is better matched by some of the more depauperate specimens of *A. decumbens* var. *serotinus*, within the range of which it was collected. On the basis of a photograph of the type, deposited at the New York Botanical Garden, Mr. Rupert C. Barneby concurs in the foregoing interpretation. Since the name *A. miser* antedates *Homalobus de-*

cumbens Nutt. (the basonym of *A. decumbens*) by seven years, a new series of varietal combinations is necessary.

Astragalus miser* var. *decumbens (Nutt.) Cronq., comb. nov.

Homalobus decumbens Nutt. ex T. & G., Fl. N. Am., 1: 352 (1838).

A. campestris var. *decumbens* Jones, Rev. N. Am. Sp. Astr. 74 (1923).

Astragalus miser* var. *crispatus (Jones) Cronq., comb. nov.

A. campestris var. *crispatus* Jones, op. cit., 75.

Astragalus miser* var. *oblongifolius (Rydb.) Cronq., comb. nov.

Homalobus oblongifolius Rydb., Bull. Torrey Club 34: 50 (1907).

A. hylophilus var. *oblongifolius* Macbr., Contr. Gray Herb. II. 65: 37 (1922).

Astragalus miser* var. *decurrens (Rydb.) Cronq., comb. nov.

Homalobus decurrens Rydb., Bull. Torrey Club 31: 563 (1904).

A. decumbens var. *decurrens* Cronq., Leafl. West. Bot. 3: 255 (1943).

Except for *Astragalus miser*, all the species on which I wish to comment are *Compositae*. These follow in alphabetical order.

Antennaria carpathica β. *pulcherrima* Hook. was differentiated from typical *A. carpathica* Wahl. by its larger size and more conspicuous pubescence. The involucre bracts might by implication be expected to be dark as in *A. carpathica*. The apparent type at Kew bears out this assumption. The involucre bracts are brownish with pale tips, the outer wholly brownish. Since Hooker states that his variety *pulcherrima* is a foot or sometimes a foot and a half high, while the specimen found at Kew is scarcely 9 inches high, some doubt might be cast on its authenticity as the type. The only other specimen found which might possibly represent the type is a specimen 3 dm. tall in the Hooker herbarium at Kew without indication of collector. This specimen also has dark bracts. It therefore seems reasonable to confirm the traditional interpretation of *A. pulcherrima* (Hook.) Greene as a dark-bracted species. The related, chiefly more southern, largely white-bracted species is *A. anaphaloides* Rydb.

Antennaria parvifolia Nutt. has been variously interpreted by different authors, most of whom have not had access to the original material. In my discussion of the application of this name (*Rhodora* 48: 120,—1946), I neglected to point out that Piper (*Contr. U. S. Nat. Herb.* 11: 605,—1906, and subsequent works) and later St. John (*Fl. S.E. Wash. and adj. Ida.* 415,—1937) had used it for the species described by Greene as *A. aprica*. Partly due to my negligence, Boivin has recently been misled

to state (Can. Field Nat. 65: 12-13, -1951) that the identification of *A. parvifolia* with *A. aprica* has never been accepted by anybody, and that Rydberg in 1918 was the first to suspect that the two might prove to be the same.

Dr. Boivin further misinterprets my remarks to arrive at the conclusion that I do not consider *A. parvifolia* (*A. aprica*) distinct from *A. rosea* Greene (including *A. microphylla* Rydb.). Thus my conclusion that the name *A. parvifolia* Nutt. applies to the species that has been called *A. aprica* Greene, rather than to the species that has been called *A. microphylla* Rydb., *A. rosea* Greene, and various other names, is considered by Boivin to be "un exercice intellectuel de peu de conséquence". That it would certainly be did I consider *A. aprica* to be taxonomically identical with *A. rosea* and *A. microphylla*. Upon rereading my comments in *Rhodora*, I do not believe they can properly be so interpreted.

As I previously pointed out, the isotype material of *A. parvifolia* at the Academy of Natural Sciences of Philadelphia is taxonomically identical with *A. aprica* Greene, a fact first called to my attention by Dr. S. F. Blake. My examination of the type material of *A. parvifolia* at the British Museum does not bear out the statement made to me in a letter by Professor Fernald that *A. rosea* and *A. microphylla*, as well as *A. aprica*, are represented in Nuttall's original material. The material at the British Museum consists of five specimens, with three labels, evidently representing three collections, which together make up the type. All of the specimens are unsatisfactory, being young and hardly developed. The fact that the heads, even though immature, are as large as in characteristic *A. rosea* (including *A. microphylla*) suggests that at maturity they would be larger and of the proper size for *A. aprica*. The close aggregation of the heads in all the specimens is characteristic of *A. aprica* rather than of *A. rosea*, although similarly capitate forms of *A. rosea* also exist and one cannot be certain that this feature would have persisted until maturity anyhow. Two of the collections, consisting of one and two plants each, are staminate, with slightly yellowish, blunt involucre bracts. The third collection consisting of two plants, is pistillate, with pinkish, blunt involucre bracts. The immaturity of all of the specimens makes certain

identification difficult, but I believe that they all represent the same ultimate taxon, which is identical with *A. aprica* Greene. Certainly there is nothing that can clearly be identified with *A. microphylla* or with *A. rosea* in either the restricted or the expanded sense. The pink color of the bracts is insufficient basis for referring a specimen to *A. rosea*, since the same color is found, less commonly, in *A. aprica* and in some other species as well. The slight yellowish cast of the involucre bracts of some of the original specimens of *A. parvifolia* is probably a post mortem characteristic related to the manner of preparation of the specimens. A related species, *A. umbrinella* Rydb., characteristically has more or less yellowish-brown to partly blackish involucre bracts, but there the cellular structures of the involucre bracts is different, being more or less intermediate between the closely striate type of *A. parvifolia* and *A. rosea*, and the open lattice-work type of *A. alpina*. I am thus led to maintain my earlier conclusion that the name *Antennaria aprica* Greene should give way to *A. parvifolia* Nuttall.

One may perhaps digress at this point to note that Boivin apparently interprets *A. microphylla* Rydb. quite differently from the way I do, with the statement that "Quant à *A. microphylla* sensu Cronquist, je ne suis pas certain de quelle plant il s'agit". My interpretation of *A. microphylla* is based on the type of the species at the New York Botanical Garden. From his comments, and from the fact that he synonymizes *A. nitida* Greene with *A. microphylla* Rydb., I suspect that *A. microphylla* sensu Boivin may be part of the widespread and variable species for which I believe the oldest name is *A. umbrinella* Rydb. It would not seem to be *A. microphylla* Rydb. sensu Rydb.

Artemisia desertorum γ . *Scouleriana* Bess. in Hook. (Fl. Bor. Am. 1: 325,—1833) is represented in the Hooker herbarium at Kew by *Scouler 16*, which is evidently the type. The specimen is a robust, evidently perennial plant, with rather open inflorescence. It appears to be the same as *A. pacifica* Nutt. (1841) and has been so annotated without signature. Those who accept *A. campestris* in the wide sense of Hall and Clements and of Hegi, and who use variety as the most common intraspecific category, will find the following new combination necessary.

Artemisia campestris var. *Scouleriana* (Bess.) Cronq., comb. nov.

A. desertorum γ . *Scouleriana* Bess. ex Hook. Fl. Bor. Am. 1: 325 (1833).

I consider this, as well as most of the other native American forms of *A. campestris*, to belong to the subsp. *borealis* (Pall.) Hall & Clem. *Artemisia campestris* is one of the species in which two levels of infraspecific categories (a hierarchy) are necessary to express adequately the natural relationships.

To avoid possible further nomenclatural confusion I should point out that the Hooker material of *A. desertorum* δ . *Hookeriana* Bess. in Hook. seems to include both var. *borealis* and var. *Scouleriana* as I interpret them. To the extent that var. *Hookeriana* is typified by its *Scouleriana* element, the var. *Hookeriana* must be reduced to the var. *Scouleriana*.

The specimen of *Artemisia pacifica* Nutt. that bears Nuttall's asterisk is labeled "Sea[wall?] of the Columbia". It is apparently a perennial, with loosely sericeous leaves, the basal ones well developed. I see no reason to challenge the customary interpretation of its identity. As noted above, *A. desertorum* var. *Scouleriana* is the same as *A. pacifica*, and the epithet *Scouleriana* has priority in varietal rank.

The name *Aster subspicatus* Nees (1832) has recently been taken up by Hultén (Fl. Alas. & Yukon. Vol. 10, 1950) for Alaska materials that have previously been treated as two different taxa, *A. Douglasii* Lindl. (1834) and *A. foliaceus* Lindl. (1836) sens. strict. I have not seen Nees' type, but the unusually clear and detailed description leaves no doubt that it is the same as the Alaskan element of *A. Douglasii*. I have examined Dr. Hultén's specimens and discussed the problem with him. There is no doubt that the two taxa intergrade freely along the Alaskan coast, even to the point where in consideration of that region alone one might defensibly treat them as conspecific. When one considers also the material from the rest of western North America, however, I believe it remains more satisfactory to continue to treat the low, mostly single-headed, broader-leaved, more often entire-leaved Alaskan plants with more leafy involucre as *A. foliaceus* sens. strict., and to regard the taller, more branched plants with mostly narrower and serrate leaves and with less leafy involucre as another species, which now takes the name *A. subspicatus* Nees. My plans for examination of the type of *A. foliaceus* Lindl., from Unalaska, did not materialize, but Dr. Hultén assures me that only the low form, i.e. *A.*

foliaceus as it has traditionally been interpreted, occurs on Unalaska. It therefore seems unlikely that the customary application of the name *A. foliaceus* need be disturbed.

In my revision of the *Aster foliaceus* group (Am. Midl. Nat. 29: 429-468, -1943), I took up the name *A. oregonus* (Nutt.) T. & G. for a common western species which had also been known, in part, as *A. Eatonii* (Gray) Howell. The type of *Tripolium oregonum* Nutt. (the basonym for *Aster oregonus* T. & G.) was stated by Nuttall to have been taken on the banks of the Willamette River, in western Oregon. *Aster oregonus* sensu Cronquist 1943 is rare or probably wholly absent in that area, but the unreliability of Nuttall's localities is well known. The type, at the British Museum, proves to be an entire-leaved form of *A. subspicatus* Nees (*A. Douglasii* Lindl.), a species which is common in the Willamette Valley. The type has the discolored margins and bases of the involucre bracts so characteristic of *A. subspicatus*, and the reddish pappus so often found (apparently as a post mortem feature) in herbarium specimens of that species. The stem is glabrous, save for some lines of pubescence in the inflorescence, a condition frequently found in *A. subspicatus*, but quite foreign to *A. oregonus* sensu Cronquist 1943. The fact that the leaves are entire, rather than toothed as in the majority of specimens of *A. subspicatus*, is unimportant, since entire-leaved forms of the species are far from rare. *Aster oregonus* (Nutt.) T. & G. must therefore be placed in the synonymy of *A. subspicatus* Nees, along with *A. Douglasii* Lindl. The oldest available name for the species which I had treated as *A. oregonus* is *A. Eatonii* (Gray) Howell.

The name *Aster longifolius* Lam. has recently gone out of use, as being of doubtful application. The only specimen of *A. longifolius* in the Lamarck herbarium at Paris appears to be a form of *A. novi-belgii* L. The specimen is immature, with only two rather small heads having reached the flowering stage. In these the involucre has narrow, more or less herbaceous, more or less recurved involucre bracts and looks quite normal for *A. novibelgii*.

The type of *Chaenactis Douglasii* (Hook.) H. & A. is a very robust specimen with densely glandular-puberulent involucre up to 13 mm. high. The specimen has no root. The plant came

from along the Columbia River a short distance east of the Cascade Mountains, near what are now known as Celilo Falls. In this area the species is characteristically more robust and larger-headed than it is farther east, and is often perennial. The name *C. Suksdorfii* Stockwell applies to what I believe to be the same ultimate taxon. The type of *C. Suksdorfii*, from western Klickitat Co., Washington, was taken only about 25 miles (or less) west of the stated type-locality for *C. Douglasii*. It should be noted that I do not propose to restrict the name *C. Douglasii* to the *C. Suksdorfii* phase of the species. Several varieties, including a number of segregates as well as *C. Douglasii* sensu Stockwell, are to be recognized.

The type of *Chrysothamnus pumilus* Nutt. consists of two specimens, each with a label, obviously representing two collections. Only one of the labels bears Nuttall's asterisk. The specimen associated with it has the leaves 1-nerved, 1-2 cm. long, barely 1 mm. wide, and glabrous except for the irregularly scabro-ciliate margins. The other specimen has the leaves a bit wider, up to about 1.5 mm. wide, and mostly 3-nerved. It also has a little obscure scabrous puberulence on some of the twigs. I believe the name can stand in its present interpretation, noting that most botanists now consider it to represent only a variety (or subspecies) of *C. viscidiflorus* (Hook.) Nutt.

Those of us who utilize the variety as the principal infraspecific category are also faced with the problem of the identity of *Chrysothamnus pumilus* β . *euthamioides* Nutt. The type is a fragment some 5 inches long, with the inflorescence in early bud, and with some of the inflorescence of the previous year still persistent. The principal leaves are about 1-1.5 cm. long, 1-nerved, and barely 1 mm. wide. The leaves and twigs are sparsely, minutely, and irregularly scabrous-puberulent, not sufficiently obviously so for good var. *puberulus* (Eat.) Jeps., but more so than in good var. *pumilus* (Nutt.) Jeps. In view of the intermediate nature of the specimen, and in view of the dubious biological basis of the presently recognized varieties of *C. viscidiflorus*, I think it unwise to take up the epithet *euthamioides* for any of the varieties at this time.

The name *Chrysothamnus nauseosus* subsp. *albicaulis*, based on *C. speciosus* β . *albicaulis* Nutt., was used by Hall and Clem-

ents (1923) for a sporadic variant, commonest in eastern Washington, which differs from *C. nauseosus* subsp. *speciosus* (Nutt.) Hall & Clem. in the more copious and conspicuously whiter tomentum of its leaves and twigs. In my opinion the subsp. *albicaulis* as defined by them does not merit taxonomic recognition, and should be included in their subsp. *speciosus*. The type of *C. speciosus* β . *albicaulis* has the tomentum of the twigs white, but that of the leaves is thin and therefore gray. The specimen does not give the strikingly white appearance of the specimens referred to subsp. *albicaulis* by Hall and Clements. Those who wish to continue to recognize the most pubescent extreme as a separate taxon will have to find another name for it; *albicaulis* does not apply. Those (including myself) who recognize the subordinate taxa of *C. nauseosus* as varieties will have to take up the name *C. nauseosus* var. *albicaulis* (Nutt.) Rydb. for the plant otherwise known as *C. nauseosus* var. *speciosus* (Nutt.) Hall, or *C. nauseosus* subsp. *speciosus* (Nutt.) Hall & Clem.

The proper application of the name *Cirsium brevifolium* Nutt. has long been uncertain. The type consists of two fragments, each apparently representing part of a single branch. They nicely match Nuttall's description, except that the flower-color (given as white by Nuttall) can neither be verified nor refuted. The shortness of the leaves noted by Nuttall in the description and in his choice of specific epithet is due merely to the fact that only the upper part of the stem (or branches), with its normally reduced leaves, is represented. The aspect of the specimens, and the technical characters, so far as they are represented, are those of the white-flowered species later described as *Carduus palousensis* Piper.

Dr. Gerald Ownbey has recently noted (*Rhodora* 54: 34,—1952) the resemblance of *C. brevifolium* to *C. Flodmani* (Rydb.) Arthur, while reserving judgment as to its actual identity. Aside from the fact that Nuttall described the flowers of *C. brevifolium* as white, while those of *C. Flodmani* are typically purple and only rarely white, examination of the type discloses some features not readily compatible with *C. Flodmani*. The leaves are glabrate above, as in *C. palousense*, rather than persistently pubescent as in characteristic *C. Flodmani*. One of the two specimens retains a very thin coating of arachnoid tomentum on the

upper surface of the leaves, but even here the contrast between the green upper surface and the white-tomentose lower surface of the leaves is striking, and what little pubescence remains on the upper surfaces of the leaves looks as if it was about ready to fall off. The achenes are sufficiently immature so that they are bent and partly collapsed, but even so they are 4–4.5 mm. long, about the normal upper limit for mature achenes of *C. Flodmani*. At maturity they would more likely be within the characteristic size-range (5–6 mm.) of *C. palousense*. From his study of Nuttall's itinerary and the species involved, Dr. Ownbey tells me that Nuttall probably passed out of the range of *C. Flodmani* shortly before that species ordinarily comes into flower, while he passed through eastern Oregon during the proper season for *C. palousense*. Although *C. palousense* is commonest in the Palouse region of southeastern Washington, it also extends well down into eastern Oregon, south of Nuttall's route. I am satisfied that the name *Cirsium brevifolium* Nutt. properly applies to the species now commonly known as *C. palousense* (Piper) Piper.

John Thomas Howell has recently pointed out (Am. Midl. Nat. 30: 29–31,–1943) that two distinct species have been passing under the name *Cirsium edule* Nutt. He restricted the name *C. edule* to the widespread phase which has a very slender corolla with a relatively very long tube and short lobes, and has the style included or barely exerted. He took up the name *C. Macounii* (Greene) Rydb. for the plant occurring from the Cascade Mts. of Washington to the Pacific coast, which has a coarser corolla with relatively shorter tube and longer lobes, and has the style conspicuously exerted. Other, mostly less tangible differences exist between the two species. Howell's typification was logical and reasonable, especially in view of the fact that the type of *C. edule* was supposed to have been collected in the Blue Mts. of eastern Oregon, beyond the range of *C. Macounii*. Unfortunately, the type itself, at the British Museum, proves to be the same as *C. Macounii*, and no original material of Nuttall's species has been found in the other herbaria (Gray Herbarium of Harvard University, and Academy of Natural Sciences of Philadelphia) where it might reasonably be sought. A single dry corolla from the type showed a tube 8 mm. long, the

throat 4.5 mm. long, and the lobes 4–5 mm. long, and had the style exerted 4 mm. *Cirsium edule* sensu Howell, on the other hand, has the tube 12–18 mm. long, the throat 4–6 mm. long, and the lobes 2–4 mm. long, with the style included or exerted only about 1.5 mm. A single dry corolla of *C. edule* sensu Howell was laid alongside that of the type for comparison; the characteristic difference in coarseness was conspicuous, the corolla of the type being much coarser. Another corolla extracted from the type specimen showed no significant differences from the first one. Although the corolla-throat on the type material is unusually short, the corolla and style are otherwise characteristic of *C. Macounii*, and wholly incompatible with *C. edule* sensu Howell. It therefore seems necessary to identify *C. edule* Nutt. with the later *C. Macounii* (Greene) Rydb., and to suppose that here, as in a number of other cases, Nuttall's geographical data are incorrect.

So far as I am aware, there is no name available for *Cirsium edule* sensu Howell. A new one is therefore proposed.

Cirsium brevistylum Cronq., spec. nov. Planta robusta, usque ad 2.5 m. alta, caulibus crassis subsucculentis plus minusve arachnoideo-villosis, sub capitulis moderate attenuatis; foliis parum spinosis, viridibus vel subtus tenuiter floccosis; capitula plerumque aggregata, involucre 2–4 cm. alto, bracteis eglutinosi plus minusve arachnoideis paulum imbricatis; corollis (siccatis) purpureis, tubo tenuissimo 12–18 mm. longo, fauce 4–6 mm. longa, lobis aequalibus vel subaequalibus 2–4 mm. longis; stylo incluso vel usque ad 1.5 mm. exserto.

Type: *A. A. & E. G. Heller 3963*, near Montesano, "Chehalis" (Gray's Harbor) Co., Washington, June 27, 1898; deposited at the New York Botanical Garden.

The type sheet of *Grindelia nana* Nutt., at the British Museum, bears two collections, each with a label, representing two different phases of the species. One of these has relatively short-tipped involucre bracts and conspicuously toothed leaves, thus matching Nuttall's description of *G. nana*. It is labeled "Fort Vancouver & c." The other specimen has longer-tipped, more conspicuously squarrose bracts, and seems to correspond, as to the involucre, to Nuttall's *β. integrifolia*. Its leaves, though less strongly toothed than those of the other specimen, are not, however, "nearly entire" as described by Nuttall. The label for this specimen reads "Vancouver". No other Nuttall material of *G.*

nana was found, and neither of the specimens is marked as being *β. integrifolia*. If we assume that in describing the leaves of var. *integrifolia* as "nearly entire", Nuttall was merely contrasting them to the leaves of the other and presumably typical specimen, the potential difficulty is resolved. Although it is now widespread in the United States as a sporadic introduction, *G. nana* sens. lat. is probably native only from the eastern edge of the Cascade Mts. to western and northern Idaho and western Montana; I doubt that either of Nuttall's collections came from the vicinity of Fort Vancouver on the west side of the Cascades. I propose to typify *G. nana* Nutt. by the short-bracted specimen, which is taxonomically identical with the plant described as *G. integerrima* Rydb. and treated by Steyermark as *G. nana* var. *integerrima*. *Grindelia nana β. integrifolia* would correspondingly be typified by the long-bracted specimen. I would reduce *G. Brownii* Heller and *G. Paysonorum* St. John to *G. nana* var. *integrifolia*.

Steyermark (Ann. Mo. Bot. Gard. 21: 548,—1934) notes that the apparent isotype of *G. nana* at the Gray Herbarium is short-bracted and closely resembles *G. integerrima* Rydb. He then goes on to say that "Granting that Nuttall's specimen was a depauperate individual of the common form in the vicinity of Fort Vancouver and adjacent area and that his *β. integrifolia* has the longer bracts typical of the *G. nana* form common in that portion of Oregon and Washington, we should take for the historical *G. nana* the common plant of that portion of Oregon and Washington with longer-tipped bracts, similar to Nuttall's *G. nana β. integrifolia*. . . ." We are thus evidently agreed as to the typification of *G. nana* and *G. nana β. integrifolia*, and further agreed as to the biological nature of *β. integrifolia*. We differ as to which intra-specific population with which to associate the agreed type material of *G. nana*. In contradiction of his stated reason (geographical distribution) for associating the type with the population which it does not morphologically resemble, Steyermark's own statement (p. 542) of the range of *G. nana* sens. strict. would seem to exclude the whole Willamette Valley and Puget Sound area, and with this restriction (save for casual introductions) I would wholly agree. In view of the known unreliability of Nuttall's geographical data, and

in view of the fact that there is *no* form of the species which is or can be assumed to have been "common . . . in the vicinity of Fort Vancouver and adjacent area", I believe that the type of *G. nana* should be associated with the population which it morphologically resembles, namely the phase described by Rydberg as *G. integerrima*. *Grindelia nana* sensu Steyermark will accordingly take the name *G. nana* var. *integrifolia* Nutt.

Several years ago (*Rhodora* 48: 122-125, -1946) I reduced a number of supposed species to varietal status under *Petasites frigidus* (L.) Fries. For the phase with distinctly but not deeply lobed leaves I adopted the name var. *corymbosus* (R. Br.) Cronq., following the interpretation of the identity of *Tussilago corymbosa* that had been made by Hooker and later by Herder. This interpretation of *Tussilago corymbosa* was questioned by Professor Fernald, on the basis of a photograph at the Gray Herbarium of supposedly authentic material of *T. corymbosa* R. Br. Since the leaf in the photograph did not match Brown's description, and since it was not organically attached to the stem, I maintained Hooker's interpretation of the name in spite of the evidence of the photograph. I have now studied two sheets at the British Museum and one at Kew, all of which apparently represent original material of *Tussilago corymbosa* R. Br. All of these specimens are labeled as coming from Melville Island. The one at Kew is indicated as having been collected by Sabine; one of the specimens at the British Museum is marked as having been collected by Sabine; the other, segregated in the institutional type collection, is marked as having been collected by Capt. Parry. (Brown cited no specimens, but the introduction of his paper indicates the plants to have been collected on Melville Island by Parry, Sabine, et al.) None of these sheets has a basal leaf organically attached to the stem, but all of their basal leaves are clearly of *P. frigidus* var. *frigidus*, the phase of the species with merely coarsely and irregularly toothed, scarcely lobed leaves. The statement in the original description that the leaves are lobed can perhaps be explained by assuming that Brown was attempting to emphasize their angularly sublobed outline. It is furthermore doubtful that the lobate phase which I treated as *P. frigidus* var. *corymbosus* extends as far north as Melville Island. Hultén is quite positive

on this matter in the Flora of Alaska (vol. 10, p. 1583,—1950) and has vigorously maintained the point in conversation. I therefore now accept the conclusion of Fernald and of Hultén that *Tussilago corymbosa* R. Br. is a synonym of *Petasites frigidus* sens. strict.

Hultén has also maintained in the same work that *P. hyperboreus* Rydb. should be held as specifically distinct from *P. frigidus*, in spite of the extensive hybridization between the two. Personal conversation with Dr. Hultén and examination of his specimens confirm the impression gained from his published discussion that our difference is one of taxonomic philosophy rather than one of understanding of the biological situation. We are agreed that the difference in leaf-outline is so striking that one is at first encounter impelled to consider that two species are represented. We are agreed that the hybridization between the two is so extensive that the obvious influence of *P. hyperboreus* on *P. frigidus* extends far beyond the geographic limits of pure *P. hyperboreus*. We are agreed that hybrids between *P. sagittatus* and *P. frigidus* (either sens. strict. or sens. ampl.) are relatively rare. We differ in that Dr. Hultén maintains that the amount of morphological difference between *P. frigidus* and *P. hyperboreus* is so great as to prevent their being considered conspecific, while I maintain that the extensive intergradation and admitted close relationship between the two necessitates their inclusion (as varieties) in the same species. I would further point out that the morphological differences, although conspicuous, concern only the size and outline of the leaves, and might be due to only a very few genes. Florally, and in other vegetative respects save for mere vigor, they are identical. There are some genera, notably *Aster* and *Senecio*, in which it may become necessary to treat as distinct species taxa which are no more distinct than *P. frigidus* and *P. hyperboreus*, because otherwise one would have to include such a large number of very diverse entities in the same species as to render the concept of species practically meaningless. This is not the case in *Petasites*. By expanding the limits of *P. frigidus* as I have done (and as Herder did before me, under another generic name), one arrives at a coherent, sharply definable unit. I therefore maintain my previous definition of the species.

It now becomes necessary to provide a varietal name for the plant which I treated as *P. frigidus* var. *corymbosus* and which Hultén treats as *P. hyperboreus*. I concur in Hultén's conclusion (1950) that *P. frigidus* var. *hyperboreoides* Hultén (Fl. Aleut. Isl. 1937) is morphologically intermediate between *P. frigidus* sens. strict. and *P. hyperboreus*. Characteristic *P. hyperboreus* is not known to occur in the type region of *P. frigidus* var. *hyperboreoides*, although *P. frigidus* proper is there. This name therefore cannot be used for *P. hyperboreus*. The oldest name for the taxon in question is apparently *P. palmatus* var. *frigidus* Macoun (1886), based on specimens from British Columbia, but obviously Macoun's variety cannot be transferred without change of name into *P. frigidus* (L.) Fries. The next oldest name is *P. nivalis* Greene, based on plants from Mt. Rainier, Washington. It is thought best to adopt Greene's epithet in varietal status, in spite of the fact that some of the more recent ones are more familiar.

***Petasites frigidus* var. *nivalis* (Greene) Cronq., comb. nov.**

P. nivalis Greene, Pitt. 2: 18 (1889).

The three varieties of *P. frigidus*, as I understand them, may be characterized as follows:

Leaves merely coarsely toothed, scarcely or barely lobed; characteristically arctic, extending south, uncommonly, to central Washington.
var. *frigidus*

Leaves evidently lobed.

Leaves palmately or more often pinnipalmately lobed and veined, the lobes ordinarily not extending more than half way to the base (or often deeper in western specimens, which are distinctly pinnipalmate); leaves seldom more than 2 dm. wide, seldom evidently wider than long; characteristically subarctic or of boreal forests, extending south to the Gaspé Peninsula of Quebec, northern Minnesota, and at high elevations in the mountains to northern Oregon var. *nivalis*

Leaves palmately lobed and veined, the lobes commonly extending well over half way to the base (or in western specimens often only about half way to the base); leaves tending to be broader than long, often very large (up to 4 dm. wide); more southern than the other varieties, extending south to California, Minnesota, Michigan, and Massachusetts. var. *palmatus*

Eastern materials of both var. *nivalis* and var. *palmatus* vary about slightly different norms from what their western counter-

parts do, without any of the differences being sufficiently constant to warrant taxonomic segregation. The var. *palmatus* in eastern America has more deeply lobed leaves, with fewer small callous teeth than it has in western America; the leaves of var. *nivalis* in western America may be more deeply lobed than in the east, but they are also more constantly pinnipalmate instead of palmate. Thus in eastern America the two varieties are more consistently distinguished by the depth of the lobes of the leaf, while in western America they are best distinguished by the outline of the leaf and orientation of the lobes.

Senecio bivestitus Cronq., described in 1950 from specimens from the Beartooth Mts. of Wyoming, proves to be identical with *S. fuscatus* Hayek, a species otherwise known from widely disjunct areas in central Europe, Siberia, and Alaska and adjacent Yukon. The Beartooth Mt. station is more than 1500 miles from the nearest presently known locality for the species, which is well represented with Alaskan materials in the Museum of Natural History at Stockholm.

The type of *Senecio cordatus* Nutt., bearing the data "Columbia plains and woods", is a robust specimen of *S. integerrimus* Nutt. sens. lat., quite possibly the var. *ochroleucus* (Gray) Cronq. as suggested by Gray (sub *S. lugens* var. *ochroleucus*) in the Synoptical Flora. The leaves are only deltoid-subcordate, rather than truly cordate. The original color of the rays is now difficult to determine, but it seems probable that they were not strictly white.

PUGILLUS ASTRAGALORUM XV: FOUR NEW SPECIES

BY R. C. BARNEBY

Wappingers Falls, New York

Astragalus Waterfallii Barneby, spec. nov., *A. tephrodem* var. *brachylobum* (Gray) Barneby habitu toto simulans, sed imprimis legumine triquetrim compresso 2-loculari graviter discrepans.

Herba perennis humilis subacaulescens vel breviter caulescens e radice lignosa valida, pilis rectis appressis nonnullisque adscendentibus basifixis fere undique strigulosa, praeter foliolorum paginam superiorem glabram viridem cinerea vel canescens; caulibus e radice collo vel e caudice breviter furcato ortis ad 5.5 cm. usque longis diffusis, internodiis 2-10 mm. longis stipulis imbricatis saepe occultis; stipulis membranaceis pallidis ovato-tri-

angularibus -lanceolatisve 3-8 mm. longis, petiolo breviter adnatis, caulem semiamplectentibus inter se liberis; foliis petiolatis 3-10 cm. longis; foliolis 4-12-jugis ellipticis ovalibus ovato-oblongis oblanceolatisve obtusis vel acutiusculis 3-10 mm. longis; pedunculis (1.5) 3-11 cm. longis, ad anthesin adscendentibus fructiferis prostratis; racemis breviter laxaeque (4) 6-17-floris, floribus adscendentibus patulisve, axi fructifero parum elongato (0.5) 1-4 cm. longo; bracteis 2-7 mm. longis pedicellos ad anthesin 1-2 mm. fructiferos 1.5-2.5 mm. longos fere semper superantibus; bracteolis setaceis lanceolatisve rarius 0; calyce 10-14 mm. longo, albo-vel nigro-striguloso-pilosulo, tubo late cylindrico 8-11.6 mm., dentibus subulatis vel triangularibus 1.3-3 mm. longis; petalis roseo-purpureis, carinae apice saturatius maculato; vexillo sensim per 40° recurvo oblanceolato vel ovato-cuneato 19-23 mm. longo, (6.4) 8-10.3 mm. lato; alarum vix breviorum unguiculis 9-11.4 mm., laminis anguste lanceolato-oblongis obtusis supra medium paulo incurvis 10.2-12.8 mm. longis, 2.1-3.5 mm. latis; carinae 16.6-19 mm. longae unguiculis 9-10.9 mm., laminis lunatim oblanceolatis 7.7-9.3 mm. longis, 2.9-3.5 mm. latis, per 85°-95° in apicem valde obtusum incurvis; legumine adscendenti (humistrato) sessili, cum receptaculo demum articulado, anguste oblongo-ellipsoideo subrecto vel leviter incurvo (1.7) 2-3 cm. longo, 5-8 mm. diametro, basi cuneato, apice abrupte acuto cuspidato, de latere atque triquetrum compresso, angulis ventrali sutura prominula carinato lateralibus obtusis, facie dorsali sulcata, valvulis strigulosis maculatis primum carnosius demum coriaceis brunneis dorsaliter late inflexis septum completum 3-4.2 mm. latum efformantibus; ovulis 28-38; seminibus maturis ignotis.

NEW MEXICO: 21 miles west of Artesia, Eddy County, April 12, 1952, *U. T. Waterfall 10615* (type in Herb. Oklahoma A. & M. College, Stillwater¹); Hope, Eddy County, June, 1917, *Marion L. Campbell* (CAS); 46 miles east of Cloudcroft, Chaves County, *Waterfall 10606* (OKLA). TEXAS: Hueco Mts., alt. 4000 ft., El Paso County, *Ripley & Barneby 4207* (in the writer's collection). Stony slopes and open hillsides in desert grassland, locally plentiful on the easterly foothills of the Sacramento Mountains, southeastern New Mexico, south to extreme northwestern Texas. March-June.

Flowering plants of *A. Waterfallii* resemble to an extraordinary degree some forms of the variable and polymorphic *A. tephrodes* Gray, and it seems manifestly referable to Sect. *Argophylli*, in spite of its obtusely triquetrous, fully bilocular pod. Interestingly enough, the flower is that of the geographically distant *A. tephrodes* var. *brachylobus* (Gray) Barneby, which ranges from southwestern New Mexico into southern Nevada,

¹Several isotypes will be distributed by the collector.

rather than of var. *tephrodes*, whose range nearly approaches, and in western Texas perhaps overlaps, that of *A. Waterfallii*. Typical *A. tephrodes* has, in the rare *A. feensis* Jones of north-central New Mexico, its own mimetic relative, again so similar in general habit of growth that flowering specimens (between Albuquerque and Cerrillos, *McKelvey 2373*, GH, as amplified by a fruiting collection from nearly the same locality, *Ripley & Barneby 7558*, CAS) were, I think pardonably, listed as *A. tephrodes* in my revision of the section (*Amer. Midl. Nat.* 37: 465); and this again has a triquetrous, bilocular legume. Thus we find two nearly monomorphic species localized at or near the distributional limit of an apparently closely related, variable and widely diffused species differing from both in the lack of septum in the pod, a situation repeated in southern California, where the bilocular *A. leucolobus* Jones, endemic to the San Bernardino and Santa Rosa mountains, has unquestionably arisen at the edge of the vast range of closely related *A. Purshii* Dougl. And it may be relevant here to adduce the case of *A. anisus* Jones², for which no satisfactory place in the genus has hitherto been found. Associated by Jones and Rydberg, on account of its obliquely globose-ovoid, nearly beakless, bilocular pod, with Sect. *Crassicarpi*, or Sect. *Mollissimi*, where its habit or growth and dolabriform vesture are wholly anomalous, it falls easily and naturally into Sect. *Argophylli* and finds close resemblances among several species (*A. castaneiformis* Wats., especially) with unilocular pod.

These various examples of twin or at least related species differing so sharply and consistently in the presence or absence of septum provide evidence of the low systematic value of this character above the specific rank. In Sect. *Argophylli* the septum seems to be a derived and relatively recent acquisition; but this is probably not the case in the genus as a whole.

As will be apparent from the context, *A. Waterfallii* is named in honor of Prof. U. T. Waterfall, to whom the writer is indebted for much finely prepared material of New Mexican and Oklahoman *Astragali*.

²Known since 1892 from the type only, this supposedly collected near Pueblo, Colorado, *A. anisus* was rediscovered as lately as 1949 by William A. Weber near Gunnison. It has since been traced along the Gunnison Valley for a distance of about 40 miles upstream from the Black Canyon.

Astragalus Harbisonii Barneby, spec. nov., inter *Phacae* ser. *Candidissimas* Rydb. ob stipulas contra folium concretas atque legumen vesicario-inflatum 1-loculare juxta *A. anemophilum* Greene collocanda, sed ab hoc legumine subdimidio minori striguloso nec tomentello, vexillo alas multo superanti (nec subaequilongo) minus recurvo, dentibus calycinis elongatis, foliolisque ellipticis acutis absimilis.

Herba verosimiliter perennis (radice ignota) omnibus fere partibus pilis basifixis plerisque brevissimis crispulis paucisque longioribus rectiusculis adscendentibus (ad 0.4–0.6 mm. usque longis) commixtis dense villosulotomentuloso et sericeo-canescens; caulibus gracilibus ut videtur assurgetibus erective 2.5–3 dm. longis, basi tantum pauciramosis; stipulis subherbaceis demum chartaceis late triangularibus 3–5 mm. longis amplexicaulibus, imis contra petiolum per 1–2 mm. inter se concretis; foliis 5–9 cm. longis, summis brevissime petiolatis; foliolis (6) 8–11-jugis ellipticis acutis vel acutiusculis 3–11 mm. longis; pedunculis erectis strictis 5.5–10 cm. longis; racemis densiuscule 13–23-floris, floribus adscendentibus, axi fructifero parum elongato 1.5–3.5 (5.5) cm. longo, leguminibus confertis; pedicellis adscendentibus rectis, fructiferis persistentibus 1.2–1.4 mm. longis; bracteolis 2 minimis; calycis 5.2–6.6 mm. longi tubo campanulato 3.5–4.1 mm. longo, dentibus subulatis 1.7–2.5 mm. longis; petalis albidis pallide violascentibus, carina saturatius maculata; vexillo per 45° recurvo rhombico-elliptico circa 12 mm. longo, 6.5 mm. lato; alis paulo brevioribus, unguiculis 4.6 mm., laminis oblongo-oblanceolatis obtusissimis subrectis 7.3–7.9 mm. longis, 2.4–3 mm. latis; carinae 9.2–9.9 mm. longae unguiculis 4.7–6 mm., laminis semiobovatis 5.1–5.5 mm. longis, 2.6 mm. latis, abruptiuscule in apicem obtusum incurvis; legumine erecto sessili demum cum receptaculo articulatoloblique ellipsoideo vesicario-inflato 2 cm. longo, 8–9 mm. diametro, ventraliter obscure sulcato, apicem versus in rostrum brevem triangularem compressum leviter incurvum contracto, suturis filiformibus, valvulis membranaceo-chartaceis subdiaphanis immaculatis subappresse strigulosis nullibi inflexis; ovulis 24–27; seminibus maturis ignotis.

MEXICO: Baja California (northern district): Punta Baja, 6 April 1950, *Charles F. Harbison*. Type in Herb. San Diego Soc. Nat. Hist., No. 43872; isotype, kindly communicated by Mrs. Ethel Bailey Higgins, in the writer's collection.

The combination of connate stipules with sessile bladderly pod is not a common one in the genus, and is known so far from southern Alta and Baja California only in the case of *A. anemophilus* Greene, to which *A. Harbisonii* is closely related. Greene's species is locally abundant on the dunes bordering San Quintin Bay, of which Punta Baja forms the southern extremity, and a question arises as to whether *A. Harbisonii* may represent no more than a form of it. However the vesture of *A. anemophilus* is tomentose throughout, composed of fine curly entangled and

a very few longer ascending hairs, while the large pods, 3.5–4 cm. long and 1.5–2 cm. or more in diameter, are finely woolly; whereas in *A. Harbisonii* the stems and leaves are both villous and tomentulose and the pods, about 2 cm. long and 1 cm. or less in diameter, are merely strigulose. Furthermore the petals of *A. Harbisonii* are strongly graduated, with banner longer than the wings and recurved through only 45° (through 85°, and equaling or a trifle shorter than the wings in *A. anemophilus*), the calyx-teeth are subulate (not broadly triangular), the ovules 24–27 (not 32–38), and the leaflets elliptical and acute (not broadly obovate to suborbicular and obtuse). It seems hardly possible to extend the concept of *A. anemophilus*, an apparently stable species, to include so great a latitude of variation in so many directions.

In the size and vesture of the pod and in the proportions and curvature of the petals *A. Harbisonii* closely resembles *A. magdalenae* Greene, likewise a maritime species, but ranging much further south on the Peninsula. Here, however, the stipules are free, and the lustrous satiny vesture of the herbage (to which Bentham's original epithet *candidissima* is so appropriate) is composed of nearly straight appressed hairs.

Astragalus monumentalis Barneby, spec. nov. *A. desperato* Jones et *A. deteriori* (Barneby)³ habitu similis et manifeste affinis, ab illo legumine erecto multo angustiori biloculari striguloso nec patule villosa, ab hoc stipulis omnino liberis atque legumine magis compresso in receptaculo arcte sessili (nec in gynophoro insidenti), petalis purpureis, aliisque notulis discedens.

Herba pumila depressa caespitosa, perennis sed verosimiliter primo anno florens, pilis basifixis appressis subappressisque ad 0.7 mm. usque longis fere undique striguloso-cinerea; caulibus e collo radicis verticalis gracilis vel apud plantas vetustiores e caudice breviter ramuloso ortis 1–3 cm. longis prostratis, internodiis congestis stipulas vix duplo superantibus; stipulis submembranaceis late ovatis vel triangularibus 2–5 mm. longis, imis amplexicaulibus sed haud connatis; foliis 1.5–5.5 cm. longis, petiolo rachique gracilibus inferne nonnumquam persistentibus; foliolis (2) 4–7 (8)-jugis obovatis oblongo-ellipticis vel ellipticis obtusis leviter retusis acutisve 3–9 mm. longis, plerisque conduplicatis extrorsus falcatis demum facile deciduis; pedunculis 1.5–5 cm. longis, fructiferis reclinatis; racemis laxe 3–8-floris, floribus adscendentibus, axi fructifero 8–15 mm. longo; bracteis membranaceis lanceolatis 1.5–5 mm. longis, pedicellum rectum circa 1 mm., fructiferum

³*Astragalus deterior* (Barneby) Barneby, stat. nov. *A. naturitensis* var. *deterior* Barneby, Leaf. West. Bot. 5: 33 (1948). Cf. discussion below.

ad 1.7 mm. longum superantibus; bracteolis 0; calycis pilis albis vel nonnullis pullis adpersis strigulosi tubo campanulato 3.7-4.5 mm. longo, dentibus subulatis 1-2 mm. longis; petalis purpureis; vexillo ultra unguiculum flabellato-cuneatum ovato 8.5-13 mm. longo; alis 8.1-12 mm. longis, laminis lunatim oblongo-ovatis obtusis 5.4-8.5 mm. longis; carinae 7.8-11 mm. longae laminis semiobovatis subrectis 5.3-6 mm. longis, circa 2.3 mm. latis, abrupte per 100° in apicem deltoideum obtusum incurvis; legumine adscendenti arcte sessili cum receptaculo demum articulado ambitu lineari-lanceolato sensim incurvo 1.8-2.5 cm. longo, 3.5-4 mm. lato, basi obtuso, apice abrupte acuto et cuspidato, triquetrim compresso, sutura ventrali leviter concava acutissima, faciebus lateralibus latis planis dorsali angustiori et anguste sulcata, valvulis chartaceis viridibus lutescentibus purpureo-guttulatis vel immaculatis, pilis appressis 0.3-0.4 mm. longis strigulosis, profunde inflexis septum completum vel fere completum efformantibus; ovulis circa 16; seminibus (submaturis) brunneis scrobiculatis circa 2 mm. longis.

UTAH: White Canyon, 25 miles north of Hite, Garfield County, alt. 5000 ft., May 18, 1950, *B. F. Harrison 11595*. Type in U. S. Nat. Herb., No. 2006332. ARIZONA: 12 miles north of Kayenta, Navajo County, alt. 5300 ft., *Peebles & Fulton 11928* (U. S. Nat. Herb.).

Astragalus monumentalis has been known for several years⁴ in the form of fragmentary specimens collected near the south entrance to Monument Valley (whence the epithet), but was left undescribed until further material could be secured. The fine specimens now at hand, kindly communicated by Mr. C. V. Morton, permit a clear, if still not quite complete view of a striking novelty related to *A. desperatus* Jones and *A. deterior* Barneby. Similar in general habit to both, it is readily distinguished from the former by the erect, linear-lanceolate, shortly strigulose (and not declined, obliquely ovoid, villous-hirsutulous) pod, and from the latter, to which it seems more directly allied, in the following characters:

A. MONUMENTALIS

Stipules all free, the lowest amplexicaul but not embracing more than $\frac{3}{4}$ the stem's circumference.

Petals bright pink-purple, drying violet

Keel 7.8-11 long

Pod strictly sessile on the receptacle,

A. DETERIOR

Stipules, at least near the base of the stem, shortly connate opposite the petiole

Petals ochroleucous, tinged with sordid purple

Keel 5-7.5 mm. long

Pod sessile but elevated on a slender

⁴It is the *A. ensiformis* of Kearney & Peebles, Fl. Pl. Ariz. 488. 1942, as to the collection cited from Kayenta (not Jones), later recognized by them as an undescribed species, in Fl. Ariz. 470. 1951.

the body narrowly and deeply inflexed as a complete or nearly complete septum 1.2–2 mm. wide

stipelike gynophore 0.2–1 mm. long and jointed to it, the body shallowly and openly sulcate dorsally, the valves inflexed as a rudimentary septum 0.2–0.6 mm. wide

Ovules about 16

Ovules 8–10

The type-specimens are labelled as having been found in "wet sand at bottom of a narrow wash," but this is unlikely to prove a characteristic habitat. Considerations of general growth-habit and analogy with its close allies suggest that *A. monumentalis* is normally xerophytic, and is probably to be classed among the "ledge-pavement" species alluded to in an earlier paper (Leaflet West. Bot. 5: 82, sequ.).

Since *A. deterior* was first described I have seen more of it (*J. T. Howell No. 24756*, CAS) and now believe it to be so far distinct from *A. naturitensis* Pays. as to deserve specific status. The gynophore and incipient septum of the pod, and the connate lower stipules, when added to the characters already emphasized (Leaflet West. Bot. 5: 89, in key), are abundantly distinctive. There seems to be no valid reason for excluding *A. naturitensis* from Sect. *Argophylli*; whereas *A. deterior* belongs to a small section endemic to the Colorado Basin of which *A. desperatus* may be considered typical.

Astragalus carminis Barneby, spec. nov. affinitatis dubiae, *A. madrensi* Jones floribus mediocribus et legumine lineari-oblongo biloculari haud absimilis, sed legumine manifeste stipitato (nec more *Hamosae* sensu Rydb. arcte sessili) aliisque compluribus notulis abhorrens.

Herba perennis gracilis pluricaulis, caulibus simplicibus pauciramosisque e caudice breviter ramuloso adscendentibus 1.5–5 dm. longis, cum inferiori foliolorum pagina pube appressa basifixis adpersim strigulosis; stipulis deltoideis vel lanceolato-acuminatis hyalino-marginatis 1.5–3 mm. longis inter se liberis; foliis 3–8 (10) cm. longis breviter petiolatis; foliolis 6–13-jugis oblongo-obovatis vel obovato-cuneatis retusis bicoloribus, inferne pallidis; pedunculis gracilibus adscendentibus 4–9 cm. longis; racemis laxe (4) 6–10 (12)-floris, floribus patulis, axi fructifero 1–5 cm. longo; pedicellis ad anthesin vix 1 mm., fructiferis 1.5–2 mm. longis, adscendentibus; bracteolis 0; calycis parce nigro- et albo-strigulosi tubo campanulato antice subgibboso 1.6–2.3 mm. longo, dentibus lanceolatis vel triangulari-subulatis 1.6–3 mm., rariis ad 4 mm. usque longis; petalis pallide purpurascensibus vel subcoeruleis; vexillo abrupte per angulum rectum recurvo obovato-cuneato circa 10 mm. longo, 4.5–5.5 mm. lato; alis vexillo subaequilongis, unguiculis 2.5–3 mm., laminis anguste oblongis obtusis leviter incurvis circa 8 mm. longis, 1.8 mm. latis; carinae circa 7.5 mm. longae unguiculis 3 mm., laminis 4–4.5 mm. longis, 2.2–2.5 mm. latis, per angulum rectum in apicem triangu-

larem acutum abruptiuscule incurvis; legumine patulo vel laxe adscendenti lineari-oblongo gradatim incurvo vel falcato 12–20 mm. longo, 2.5–3 mm. lato, basi in stipitem brevem 1–2 mm. longum calyce haud rupto persistenti indutum contracto, triquetro-compresso, dorso sulcato, valvulis chartaceis transverse reticulatis glabris introflexis septum completum circa 1.6 mm. latum efformantibus; ovulis circa 12; seminibus brunneis 2–2.5 mm. longis.

MEXICO. Coahuila: Cañon de Sentenela on Hacienda Piedra Blanca, Sierra del Carmen, Municipio de Villa Acuña, 6 July 1936, *F. Lyle Wynd & C. H. Mueller* 556. Type in U. S. Nat. Herb., No. 1639958. Hillcoat Mesa, west of Encantada Ranch, *E. G. Marsh* 1488 (this and the following in herb. Gray.); Sierra del Pino, near La Noria, *Johnston & Mueller* 513, 689; Cañon de Ybarra, Sierra del Pino, *R. M. Stewart* 1867; Sierra Almagre, near the Chihuahua boundary, *Johnston & Mueller* 1137.—Moist streamsides, canyons and open slopes among pines and scrub-oaks, apparently not uncommon in the mountains of north-western Coahuila south of the Big Bend of the Rio Grande. June–September.

The type of *A. carminis* has been referred to *A. madrensis* Jones, a species of the Sierra Madre in central Chihuahua not unlike it in general habit but characterized by deflexed sessile pods. The natural affinities of *A. carminis* are unclear, and cannot be profitably explored against the disorganized background of our present knowledge of the genus in Mexico. It must suffice here to point out that the combination of free stipules, loose racemes of spreading (and not abruptly deflexed) flowers, and shortly stipitate, triquetrous, bilocular legume is peculiar to *A. carminis* in the Texano–Mexican region.

The writer is indebted to Dr. Ivan M. Johnston for the loan of the fine series of specimens in the Gray Herbarium, these fully confirming the distinctness of the type, by which the characters of *A. carminis* were first recognized.

NEW RECORDS OF WESTERN WEEDS

BY JOHN THOMAS HOWELL

During the summer of 1952 I collected a number of Old World plants occurring as weeds in Oregon and California. The following seem to represent new records for the states where I found them.

AGROPYRON TRITICEUM Gaertn. This annual Russian wheat-grass was locally common along the highway 4.5 miles east of Baker, Baker County, Oregon, July 4, *Howell 28615*. According to Agnes Chase in Hitchcock's Manual ed. 2, the grass is sparingly introduced but is reported from stations in Montana, Wyoming, Idaho, and Washington (p. 232). It promises to become a widespread and common grass on western range lands.

ALOPECURUS PRATENSIS L. Meadow foxtail was found growing with *Glyceria* and *Carex* in marshy ground along the highway, 2 miles north of Castle Crags, Shasta County, California, June 13, *Howell 28328*. Fifty years ago Howell reported this European grass as naturalized in the range of his northwestern flora, so it is not surprising that it has at last appeared in northern California. According to Mrs. Chase, the meadow foxtail is known to grow spontaneously in the western states only in Oregon and Idaho. Robbins has stated that it "is sparingly naturalized in California" but cites no locality (Univ. Calif. Agr. Exp. Sta. Bull. 637: 18,—1940). The meadow foxtail is not listed, however, by Robbins, Bellue, and Ball in their Weeds of California (1941, 1951).

MALCOLMIA AFRICANA (L.) R. Br. This mauve-flowered annual mustard was collected 8.3 miles southwest of Wagontire, Lake County, Oregon, July 6, *Howell 28730*. At this place it grew on a sandy alkaline flat together with *Phacelia glandulifera* Piper and *Cryptantha Watsonii* (Gray) Greene between shrubs of *Sarcobatus vermiculatus* (Hook.) Torr. and *Artemisia tridentata* Nutt. I had seen the plant near Burns, Harney County, but I had not collected it, thinking it must be as well known in Oregon as it is in Utah, Nevada, and Arizona. Only an irresistibly attractive specimen caused me to collect it when I did!

MEDICAGO MINIMA (L.) Gruffberg. Mats of this bur-clover grew on shaded banks 2.7 miles from Gold Hill on Sams Valley road, Jackson County, Oregon, July 9, *Howell 28805*. It had been found in the same region by M. E. Peck, May 22, 1948 (roadside, 4 miles northeast of Central Point, Jackson County, No. 24852). In the western United States the species has been reported from Texas, Arizona, and California.

CHRYSANTHEMUM BALSAMITA L. The costmary of Europe was rare in low ground along Table Rock Road in the Rogue

River Valley not far from the Table Rock historical monument; Jackson County, Oregon, July 9, *Howell 28792*. The flower-heads were only in bud but the plant was unmistakable because of the minty fragrance of the herbage. The only other reports for costmary in the western states of which I know are St. John's for Washington (Fl. SE. Wash. Adj. Idaho, p. 436) and Cronquist's for Idaho (Leafl. West. Bot. 5: 72).

NAVARRETIA HETERANDRA IN OREGON. In July, 1952, on a dry grassy slope near the southeastern base of Table Mountain, Jackson County, Oregon, I found *Navarretia heterandra* Mason (*Howell 28800*) growing with *N. pubescens* (Benth.) H. & A. and *N. tagetina* Greene. Mr. Beecher Crampton confirmed my determination as well as my opinion that the plant has apparently not been reported before from Oregon. Mr. Crampton has not checked my determination of the following Oregon collections, but they also seem referable to *N. heterandra*: roadside hollow, 8 miles south of Trail, Jackson County, *Howell 6755* in 1931; near Trail in the Rogue River Canyon at Elk Creek, Jackson County, *Howell 6762* in 1931; 9 miles north of Grants Pass, Josephine County, *Eastwood & Howell 2811* in 1936. It was at the Elk Creek station where I also found the rare *N. subuligera* Greene (*Howell 6778*), apparently the only reported collection of that species from Oregon (cf. Jepson Fl. Calif. 3:150).

The type of *N. heterandra* was collected in Tehama County, California, on the south side of Cottonwood Creek, across the creek from the town of Cottonwood, which is in Shasta County. The plants grew on a dry grassy flat together with *N. pubescens*, *N. tagetina*, *N. viscidula* Benth., and *Lagophylla glandulosa* Gray. The collection number is *Howell 12233*, not *12223* as given in the original description (Madroño 8:197). — JOHN THOMAS HOWELL.

ERRATA. The following corrections must be noted to rectify two egregious errors in LEAFLETS OF WESTERN BOTANY, Vol. 7, No. 1:

Line 15, page 4, should read: *flora with the finding of this curious parasitic plant on sand*; and,

Line 33, page 15, should read: *Annual herb . . .*, not *Perennial herb. . .*.—JOHN THOMAS HOWELL.

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of
WESTERN BOTANY

*In Commemoration of the
Centennial of the
California Academy of Sciences
1853-1953*



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OUR FIRST HUNDRED YEARS:

*Botany at the Academy
from the
Days of Gold*



THE CALIFORNIA BOTANICAL CLUB

presents

a Symposium

in the Centennial Year

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CALIFORNIA ACADEMY OF SCIENCES

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LEAFLETS OF WESTERN BOTANY

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Botany at the Academy in the City of the Golden Fifties *

BY JOSEPH EWAN

Tulane University, New Orleans

When the five doctors, a real estate man, and a school superintendent met informally on April 4, 1853, to consider organizing an academy to bring together persons with a collecting urge, or a curiosity to know the singular forms of life that they noticed were different from those "back home," there could have been little notion of the expeditions, comprehensive collections, and reference libraries in the natural sciences that would follow. Though we know little about some of the men who met that day to speak quite honestly, they must have had something of the spirit of the Salem merchants who while they spent most of their time vending staples and making money always took time to remind their friends the sea captains to watch for big conch shells on the next voyage, a nice perfect shell of a Galápagos tortoise, or a better tail feather of the Australian lyre bird than Nicholas Titcomb down the way just acquired.

Lewis W. Sloat, the real estate man in whose office the founders of the California Academy of Natural Sciences met on old Montgomery Street, was an amateur conchologist and had a cabinet of shells in his office.

Colonel Thomas J. Nevins must certainly have been an idealist! For it was Nevins who persuaded the Common Council of San Francisco to establish a free public school system against considerable opposition. This was in 1851. After the first meeting the Academy repaired to Col. Nevins' office at 622 Clay Street, and they continued to meet there for many years. It was not until 1874 that the Academy moved to larger quarters in Dr. Stone's old brick church at California and Dupont streets. Of two of the five physicians we have little knowledge. Dr. Andrew Randall was selected chairman of the first meeting, and

*This account of botany and botanists in the early decades of the California Academy of Sciences (the name of the institution since January, 1868) has been generously furnished for this occasion from a full account of California naturalists, both zoologists and botanists, that will be published in the near future.

elected president of the Academy three successive years. He was shot by a gambler on July 24, 1856, and the murderer hanged five days later by the Vigilance Committee. But what may have been Dr. Randall's natural history interest I do not know. Nor do I know the interests of Dr. Charles Farris, who attended the first and third meetings of the Academy but left the state in the summer of 1853 and was lost track of. The other three physicians were well-known citizens of the city and left a distinguished record. The youngest of the three was Dr. Trask, 29, then Dr. Kellogg, 40, and Dr. Gibbons, 41, at the founding of the Academy. It is Dr. Kellogg the botanist to whom we are attentive here.

Born in New Hartford, Connecticut, educated in medicine at Charleston, South Carolina, and Transylvania College, Lexington, Kentucky, Albert Kellogg came to California in 1849 and evidently first engaged in business. He had practiced in the South but those who knew him say he was never known to request a payment. Never blessed with a strong constitution, Dr. Kellogg returned to his New England home and soon joined a party bound for California by way of the Horn. He arrived at Sacramento on August 8, 1849. The plant collections he had made along the west coast of South America at ports of call were destroyed in a flood at Sacramento soon after his arrival. He was associated in Sacramento with the Connecticut Mining and Trading Company, but removed to San Francisco about the year of the Academy's founding and established a pharmacy business there with some medical practice on the side. He entered into the spirit of the Academy from its very inception, and seems especially to have stimulated the members and visitors to the city to communicate specimens to the Academy for study and identification. One of the most prominent of these participants was Dr. John A. Veatch, of whom we shall have more to tell directly. Dr. Kellogg's personal botanizing began in earnest in the summer of 1867 when he accompanied Professor George Davidson of the United States Coast Survey and W. G. W. Harford to Alaska. Several hundred species were collected in triplicate, one sheet going to the National Herbarium at Washington, one to the Philadelphia Academy, and one remaining in the growing collection of the Academy. George Davidson described this Alaskan trip thus:

We lived in the same contracted temporary deck cabin for four or five months under many trials and inconveniences, and the sweetness of [Kellogg's] character was as pervading and refreshing as the beauty and fragrance of the flowers he gathered. . . . He was completely absorbed in his duties; he knew no cessation to the labor of collection and preservation; his genial nature attracted assistance from every one, and all learned to admire and to love him.

Davidson continues,

[Kellogg] worked for the [Academy] and believed in its success when the number of members could have been counted on one's fingers, and when the means of supporting such an institution and publishing its results came wholly from their professional earnings.

From 1867 to 1870 Dr. Kellogg visited localities from Donner and Cisco, to Ukiah, Red Mountain, Cahto, and Santa Cruz Island. Some of his local trips recall the days when the geography of California was quite different from today: "Lobos Creek, near San Francisco!" These collections often though not always carried collection numbers but a new series was evidently initiated every year. His last decade was pretty constantly spent drawing trees and shrubs. More than 400 of these drawings "including all the oaks, all the coniferous trees, poplars, many of the willows and ceanothi, dogwoods, and many herbaceous species" were left with his friends Dr. W. P. Gibbons and Mr. Harford to be disposed of as they might think best. The oak drawings were published with commentary by Professor E. L. Greene as "West American Oaks," under a subvention from Capt. James Monroe McDonald, 1825-1907, pioneer capitalist and philanthropist. Capt. McDonald was one of the three donors of the Ricksecker collection of *Coleoptera* to the University of California in 1881. Kellogg's drawings showed "the very faithfulness of detail with the taste of an artist," yet "the botanist may rely upon the scrupulous exactness of every minute line and dot." Kellogg would not have claimed the rank of scientific botanist but rather a nature lover in the true and full sense. Kellogg lived in the early years at San Francisco with Harford in a small place on Telegraph Hill where they kept "batchelor's hall." He never married and died at the home of his very dear friend Harford in Oakland in 1887. William H. Brewer tersely summarized his role when he wrote, "no name

is more intimately associated with the botany of the state during this period" than Kellogg's.

John Allen Veatch was one of those early collectors whose specimens engaged Kellogg's attention. Veatch lived in Texas from 1836 until 1845, during which years he had met the enthusiastic botanical collector Charles Wright. Veatch left a wife and five children in Texas to join the Gold Rush, and when his wife Ann failed to hear from her husband as the months stretched into years she filed a petition for divorce on the grounds of continued abandonment. It is not certain just when Veatch first contacted the Academy but in 1855 he was elected a corresponding member and he later served as Curator of Conchology. During these years Dr. Veatch — for he had certified for practice in the custom of those days — travelled from Red Bluff to the Salton Sea where he carefully inspected the mud volcanoes and wrote his observations. In 1858 Veatch was on Cedros (written "Cerros Island" in contemporary accounts) Island, where he was preceded only by the surgeon aboard H.M.S. *Herald*, Mr. J. Goodridge. Veatch's collections were by far the most extensive yet made on the island, though often scrappy specimens by our standards, and Dr. Kellogg published his discoveries in the San Franciscan weekly *The Hesperian*, illustrating many of his novelties with drawings. Kellogg's poetic soul is laid bare in the vernacular names that he gave the new species. One of Veatch's plants appeared, for example, as the "hummingbird's dinner horn." Kellogg's scientific names were not infrequently hyphenated words of curious construction that some botanists felt obliged later to edit or disregard altogether.

Though not a founder in the strict sense of being present at the meeting of April 4th, Dr. Hans Herman Behr joined the Academy on February 4, 1854, to launch a lifetime of service to the young organization. Dr. Behr was thirty-six when he joined the Academy. He was born at Colthen, Duchy of Anhalt, Germany, and took his medical degree at Berlin in 1843. His coming to the feverish San Francisco of 1850 was the outcome of his participation in the Revolution of 1848. In temperament, then, Behr easily adjusted to the rough manners of the frontier city, and took up practice at once. But he allowed plenty of time to collect plants and these he sent to Hamburg, St. Petersburg, and elsewhere. Fortunately Dr. Behr has narrated his experi-

ences of these early years in two articles on botanical reminiscences (*Zoe* 2: 2-6,—1891; *Erythea* 4: 168-173,—1896). Behr's copy of Endlicher's "Genera Plantarum" was the chief resource for the study of the troublesome specimens that were brought to the Academy at this time. He taught classes at the California College of Pharmacy and prepared his "Flora of San Francisco," a rare book today, for the use of the pupils. But Behr's interests were much broader than botany alone. He wrote poetry, humor, and travelogues — his account of two years spent in the Philippine Islands appeared in the *Atlantic Monthly*. His writings were warmly acclaimed in Germany. It is natural that his spiritual link was with Alexander von Humboldt, Schlechtendahl, Ferdinand von Mueller, Hillebrand, Louis Agassiz, and Max Müller. Those who came to San Francisco from afar were sure to find Dr. Behr a hearty host, and it would be difficult to know how important was his influence in the lives of the many scientists and others that he chanced to meet. A man of good will and generous spirit, he died at the age of eighty-six at his home at 1215 Bush Street, in the city with which he had been identified for fifty-four years.

Hiram G. Bloomer first set out for California in 1849 but had to turn back on reaching Panama because of sickness; he successfully tried again in 1850. I've no information on his principal occupation but he was devoted to botany from the first of his California residence, and participated in the life of San Francisco, serving as a member of the Committee of Vigilance and of the Fire Department. He was active, too, in the Lincoln presidential campaign. He was generous in presenting books to the Academy's library in its early years. It is important to recognize that Bloomer introduced James Lick, the philanthropist, to the needs of the Academy. It will be remembered that the Academy built new quarters on Market between Fourth and Fifth streets in 1891 upon property deeded to it by James Lick. Lick also made the Academy one of two residuary legatees, each receiving one half of his estate after all other bequests had been paid. Bloomer's botanical interests centered around the *Liliaceae*, and he grew many of the native species in his garden. Kellogg named a flower found by Dr. Veatch at New Idria *Bloomeria* in his honor. Bloomer's herbarium of several thousand sheets was evidently lost soon after its presentation to the

Academy but duplicates had been sent to Asa Gray and others during the State Survey period.

William G. W. Harford was one of those Academy members who could be expected at every meeting. "Six feet in height, of a Lincolnian gauntness, with a pioneer style of luxuriant beard and bushy eyebrows," he was even more shy and retiring than his friend Kellogg. Like Kellogg, he was of a simple manner, of a deeply religious nature, and devoted to the beautiful. Conchology was perhaps Harford's special interest, and he served as the Academy's curator in that field in 1867, 1868, 1874, and 1875. He was Director of the Academy from 1876 to 1886. Spiders and beetles also interested Harford, along with botany. He and Kellogg made up sets of Oregon and California plant collections in 1868 and 1869 and these reached the herbaria of Europe, as well as the herbaria of Engelmann, Torrey, and Gray. Greene and Parry dedicated the polygonaceous genus *Harfordia* to his memory in 1886. He was a close associate of George Davidson, with whom he travelled to Alaska in 1867 as naturalist on the United States Coast Survey. Like so many of his cronies at the Academy, Harford lived to be an octogenarian.

In the national perspective 1853 saw the beginning of the Pacific Railroad Surveys under Secretary of War Jefferson Davis. For two years these surveys reconnoitered so thoroughly and efficiently that the railroad routes of today were laid out along essentially their original markers. These surveys covered the five transcontinental routes traversed today from the Northern Pacific Railroad to the Southern Pacific Railroad via the Gila route. Each of the five field parties included a surgeon-naturalist or "botanist" who collected as opportunity afforded. The published reports arising from these surveys served as reference works for the first residents of California, as many copies of the "Pacific Railway Reports" to be seen in second-hand bookshops today will attest. Three physicians attached to these surveys, John Milton Bigelow, Adolphus L. Heermann, and John Strong Newberry, all visited San Francisco during this period and must have been welcome wayfarers for Dr. Kellogg in the city. Dr. Bigelow's collections were the most extensive for central California and over 1100 collections were enumerated in volume four alone of the Reports. Though Dr. Heermann collected in nearly all fields, he was particularly interested in birds

and birds' eggs. He introduced, in fact, the word "oology" into ornithological literature. Heermann came to California in 1849 but his activities prior to the Pacific Railway Surveys are unknown. The beautiful Heermann gull places his name in California skies.

What appears to be wholly sound scientific progress was the subject of satire by Lieut. George Horatio Derby, graduate of West Point in the Class of 1846, who wrote a book "Phoenixiana or Sketches and Burlesques" under the *nom de plume* of John Phoenix (New York, 1903). Derby's burlesque on the surveys is entitled "Official Report of Professor John Phoenix, A. M., of a Military Survey and Reconnaissance of the route from San Francisco to the Mission of Dolores, made with a view to ascertaining the practicability of connecting those points by a railroad." His scientific corps included "Dr. Abraham Dunshunner, Geologist; Dr. Targee Heavysterne, Naturalist; Herr von der Weegates, Botanist, and Dr. Fogy L. Bigguns, Ethnologist." Kearny Street is described as "densely populated, and smells of horses. Its surface is intersected with many pools of sulphuretted protoxide of hydrogen, and we found several specimens of a vegetable substance, loosely distributed, which is classed by Mr. Weegates as the *stalkus cabbagiensis*." One footnote tells of a "curious antique, to which I have given the name of the 'Dunshunner Vase,' has singularly the appearance of a *wash basin!* When the drawings are completed, it is to be presented to the California Academy of Natural Sciences." Derby's satire is dated Feb. 15, 1855. He did not remain in California to write more burlesques but died on the Florida coast in 1861. In the same volume appears "The San Francisco Antiquarian Society and California Academy of Arts and Sciences." In this sketch Derby patently parallels the founding of the Academy, beginning with a committee to draw up the constitution consisting of "Dr. Keensarvey, A. Cove, and James Calomel, M.D." Who these characters equate to in real life may test the historic senses!

The California State Legislature established the State Geological Survey on April 21, 1860. Josiah D. Whitney was selected as State Geologist and William Henry Brewer, botanist. Rather later J. G. Cooper was prominent as a zoologist. Thus just seven years to the month came the second *organized* institution for the promotion of natural sciences on the Pacific Coast. It was

fortunate, too, that Whitney and Brewer were destined to work together on this survey for they proved a well-matched team.

Whitney stayed on with the State Survey until 1874, taking the Sturgis-Hooper Professorship of Geology at Harvard the next year which he held until his death in 1896. "Honors did not come to him as abundantly as to many perhaps less worthy," concludes the historian of geology G. P. Merrill. Some strong-worded opposition to the State Survey came even from scientists. Dr. William P. Gibbons wrote in the *Overland Monthly*:

as to any report on botany, or any collection of California plants, three sets have been made up: one for the California Academy of Sciences; one for the University of California; while one has been sent out of the State, and eastern botanists have the credit of devoting their time to working it up, in occasional paroxysms, without remuneration. It would have been far better for the interests of the State and of science had this [California Geological] commission never existed.

Dr. Gibbons evinced more local pride than imagination when he said,

California scientists would have accomplished more work, without aid from the State, than has thus far, to all practical purposes, been achieved by the commission.

Gibbons' assessment appeared in August, 1875. The first volume of the "Botany Report" was published the following year, and the second volume, in a necessarily smaller edition, four years later. Kellogg, Bolander, Behr, and perhaps a few others, might have eventually described the greater part of the California flora, but the number of avoidable synonyms may well have increased thereby from the inability of the resident botanists to check against the existing specimens in eastern herbaria.

Thirty-two-year-old William Henry Brewer accompanied Whitney and his family from Massachusetts to California via Aspinwall. When the party stepped ashore from the *Golden Age*, November 14, 1860, they were greeted by Mr. S. Osgood Putnam of the California Steam Navigation Co. who had backed the State Survey appropriation in the legislature. Brewer had finished at the Sheffield Scientific School at Yale in 1852 — a member of its first class — and had studied abroad under the chemists Liebig and Bunsen. Along the academic way he had acquired a lively taste for botany and a near dead shot judgment in geology. He had applied for a post on Capt. Gunnison's expedition but had been turned down; Gunnison and his party,

it will be remembered, were massacred by a band of Indians in Utah. Brewer was "fond of travel, not for rest, but for the recreation which he found in careful observation and record of facts in all departments of human interest." No botanical collector in California up to his time made as careful field tickets as did Brewer; fortunately, too, his field book is preserved at the Gray Herbarium. His journal, edited by F. P. Farquhar and first published in 1930 under the title "Up and Down California in 1860-1864," is a rich but unscheduled dividend of the State Survey!

Asa Gray wrote in 1868 that "for the last few years no one has done so much as Mr. Bolander for developing the botany of his adopted State, and perhaps no one is likely to do so much hereafter." At that time he dedicated the pretty genus *Bolandra* of the Saxifrage Family to him. Henry Nicholas Bolander came to Columbus, Ohio, at the age of fifteen, from Schleuchtern, near Frankfort, Germany, his birthplace. In Columbus he came under the influence of Leo Lesquereux, the bryologist, and from this early contact persisted a life-long interest in mosses. Bolander arrived in San Francisco December 5, 1861, to find the State Survey staff assembled in the city. Dr. Kellogg and other members of the Academy became intimate friends of his. It is singular that there is no mention of Bolander in Brewer's letters, at least insofar as edited by Farquhar. Bolander became State Botanist at the close of the State Survey late in 1864 on the resignation of Brewer. Between 1864 and 1873 Bolander botanized over nearly all parts of the state, his ramblings being exceeded perhaps only by those of Brewer himself: from Ukiah and Red Mt. to Mt. Dana, Mono Lake, and south to Cuyamaca Mountain and San Felipe Canyon. Bolander's most serious interest was in grasses, about which he wrote briefly in the Academy's Proceedings. Lesquereux wrote in 1869 that Bolander had in less than one year collected as many species of mosses as all the other collectors together. The San Francisco publishing firm of Anton Roman & Co. published Bolander's slim quarto volume in 1870 entitled "Catalogue of the Plants growing in the Vicinity of San Francisco, embracing the Flora within 100 miles of the City." Between 1871 and 1875 he served as State Superintendent of Schools, and during this period his botanical activities began to wane. His plant collections were well known in Europe,

deCandolle reporting the herbarium at Geneva as containing 1156 species of his gathering, and his specimens were also received at Kew and Leipzig. His death occurred at Portland, Oregon, August 28, 1897, by which time his name had quite disappeared from current botanical literature.

On the morning of October 21, 1868, a destructive earthquake shook the city of San Francisco. As Bret Harte remarked, "enough that we know that for the space of forty seconds — some say more — two or three hundred thousand people, dwelling on the Pacific slope, stood in momentary fear of sudden and mysterious death." Bret Harte chastises the citizens for trying to hide the seriousness of the earthquake lest the reports have an unfavorable effect on tourist interest in the city, and adds, "it is surprising how little we know of the earth we inhabit. Perhaps hereafter we in California will be more respectful of the calm men of science who studied the physique of our country without immediate reference to its mineralogical value. We may yet regret that we snubbed the State Geological Survey because it was impractical." The earthquake and its economic reverberations threatened the Academy's income at this time, and it was Whitney and R. E. C. Stearns, in particular, who stood behind its survival.

Though not realized at the time, an important stimulus to the promotion of the natural sciences in California was the formal charter granted the University of California on March 23, 1868, with Henry Durant installed as its first president. Practically from the beginning the university worked along with the Academy across the bay in many matters of mutual scientific interest.

1869 was a critical year in California history, for that year brought the completion of the transcontinental railroad. "Sir: we have the honor to report that the last rail is laid, the last spike is driven. The Pacific Railroad is finished," read the telegram sent from Promontory Point, Utah, to President Grant, on May 10, 1869. It was not long before there set in a growing feeling against the large land holdings under the monopolistic control of the few wealthy men or corporations — such as the very group that had won the railroad triumph. "Out of three drops of rain which fall in the San Joaquin Valley, two are owned by Collis P. Huntington." The big strikes of the early

years of the gold rush were stories now; the whale oil industry began its steady decline. New industries came with the advent of the railroad. Fruit culture soon became the first agricultural interest of the state. This period of economic transition, like the earthquake of 1868 and its consequences, brought financial restrictions on the Academy.

Gustavus Augustus Eisen, born in Stockholm, Sweden, came to the United States in October, 1872, after taking his Doctor of Philosophy degree at Uppsala earlier that year. He apparently headed for California, for he soon settled at Fresno, then a pioneer community. Eisen's most important work was in horticulture. By lectures and pamphleteering Eisen fostered the introduction of the Smyrna fig and avocado into the state. He joined the Academy in 1874 and served as a curator from 1893 to 1900. From time to time he collected plants in Fresno County; for example, *Phacelia Eisenii*, named by Brandegee. Eisen must be credited, too, for his part in the creation of Sequoia National Park by executive decree. Mt. Eisen, elevation 12,000 feet, in the park, perpetuates his name. Dr. Eisen led Academy expeditions — apparently the first under its sponsorship — to Lower California in 1892, 1893, and 1894. During those years his interests included helminthology, archaeology, and geology, in addition to botany.

It was during late February or March in 1874 that Rev. Edward Lee Greene first came to California from Colorado. An enthusiastic field collector, his coming rather initiated a botanical revival. In Colorado his duties as Episcopalian rector were light and he had filled his days with botany. "But my new parish at Vallejo is too much for me," he wrote Ludwig Kumlein back in Wisconsin. "I have a large congregation and good salary, but with all that, so much pastoral work, that my scientific studies are interfered with not a little." Napa Valley in the spring! — it must have set Greene's botanical senses atingle. Always aware of the importance of the written record against which discoveries must be checked, he repaired to the Academy across the bay and conferred with Dr. Kellogg. Greene stayed at Vallejo about a year, then returned to Colorado in 1875. He filled the pulpit at Georgetown until March, 1876, then returned to California, this time to Yreka. Along with his shepherding, he found time to botanize on the Humbug Hills that first year and

in other directions away from town. On January 21, 1877, he set off for New Mexico and another charge at Silver City, taking his time along the way to collect plants. For the next few years he explored the mountains of western New Mexico and in 1882 returned to California as pastor of St. Mark's Episcopal Church on Bancroft Way in Berkeley. From this time forward Greene took an intense interest in the California flora, and it is agreed that his best work was done with that subject. He spent much of his time at the Academy both while at St. Mark's and after becoming the first Professor of Botany at the University of California. It was during this period that he founded the botanical journal *Pittonia*, and together with Jepson, *Erythea*. He continued his field work in California, and in Lower California, and from his own and the collections of others described hundreds of new species. The pages of the Academy's Bulletin bear witness to his driving capacity for work. The appearance of the "Botany of California" posed a challenge for Greene and some other resident botanists like him to extend the boundaries of our knowledge. With Greene's coming to California as professor of botany was initiated a program of local exploration into the more remote parts of the state by his students and correspondents.

During the decade of 1875-85 with its delays in the publication of the Academy's Proceedings, internal dissensions raked the organization. "It might be supposed that the Academy of Sciences was an important element in my career [in California]," said Joseph LeConte, "but not so. It had little effect in determining my scientific activity. I read many papers there, to be sure, and several of them were published in their Proceedings, but I always reserved the right to publish them elsewhere also." He remarked further that "under the presidency of J. D. Whitney the Academy was prosperous and held a high position among the scientific institutions of our country; but from that time, because of internal dissensions, it dropped lower and lower."

The "internal dissensions" of which LeConte speaks were compounded of petty jealousies and institutional politics. Jepson contended that these dissensions were "engineered" by Mrs. Mary K. Curran. Harford served as Director of the Museum from 1876 to 1886, but he "resigned" in altercation. The able

Prof. George Davidson was replaced as president by Dr. H. W. Harkness. It is clear from Setchell's biography of Mary Katharine Layne Curran Brandegee that he admired her generous qualities and judged her actions as disinterested. On the contrary, Prof. Jepson looked upon her activities as scheming and vindictive.

In the professional sense Mrs. Brandegee showed penetrating insight in botanical judgment, as abundantly demonstrated in reviews she prepared for the journal *Zoe*. Though she recorded only the briefest data on her collection labels — as if she intended to stymie another collector revisiting her station! — she made excellent series of specimens illustrating the ecologic variations to be found within a species. As Mary K. Curran she joined the Academy around 1880, after taking her M.D. degree two years before in the University of California, and began studying botany under Dr. Behr. A widow, without heavy financial obligations, she was able to devote her time and resources to the Academy's Department of Botany fully, and she was made Curator of the Herbarium in 1883. There is no doubt but that she did important spade work for the herbarium, which she described as "in a shocking condition" when she assumed the curatorship. She also became acting editor of the Academy's *Bulletin*. Mrs. Curran's marriage to Mr. Brandegee was felicitous for botany, as for the couple. Marcus Jones remarked to me on one occasion, "Brandegee should have been born a woman and Mrs. Brandegee should have been a man. So their marriage could hardly help being a success!"

Townshend Stith Brandegee came into the Academy's orbit soon after his first visit to California in 1886-87. It was the winter he came to collect tree trunks for the Jesup collection of woods at the American Museum of Natural History. A student of Daniel Cady Eaton in botany at Yale, where he graduated in engineering, Brandegee went as a young man to Colorado to carry on surveying. He took the opportunity to botanize widely over southern Colorado, as his surveying duties took him to remote districts, and what is more important he had the acumen to recognize the value of his discoveries and to communicate them to eastern botanists who were in the best position to assist him. Brandegee's self-effacing reticence won him warm friendship from Asa Gray, C. S. Sargent, and others, though his in-

creasing deafness isolated him more and more after he came to live in California. From 1884 to 1890 Mr. Brandegee visited several of the Channel Islands, one of the most ambitious trips being that to Santa Cruz and Santa Rosa islands in 1888. In 1889 the Academy sent its Curator of Birds, Walter E. Bryant, and an assistant, Charles Haines, to Magdalena Bay, and Brandegee joined the party at his own expense, collecting a large series of plants in Lower California that season. It was following this first trip to Lower California that the Brandegees were married, on May 29 in San Diego, after which they set out on foot overland to San Francisco on a botanical honeymoon! For five years thereafter the Brandegees made their headquarters at the Academy, until 1894 when they moved to San Diego. A modest and unassuming man, Brandegee expressed himself crisply on occasion. On one of the several trips to San José del Cabo, when he attended the church there more out of deference to the prevailing *mores* than to his own beliefs, he quipped: "Religion sits very lightly on the males — they think it good for women and children."

William C. Bartlett of the San Francisco Bulletin remarked in an article published in the Overland Monthly for December, 1875, that "through the munificence of a single citizen, the Academy of Sciences has been handsomely endowed, and will soon be equipped for effective work." The benefactor will be recognized as James Lick, who gave the property for the erection of the new building for the Academy on Market Street, between Fourth and Fifth streets. This new center of activity, with its fine display features for museum exhibits, was the parent of the California Botanical Club, founded on March 7, 1891, "in response to a call" from seven Academy members — something still miraculous about that number seven! — Harkness, Behr, Eisen, the Brandegees, Townshend and Kate, Mrs. Mary W. Kincaid, and Miss Agnes M. Manning, to bring the Pacific Coast botanists closer together. Ninety-nine signatures appeared on the charter roll, from Carl Purdy on the north to Cleveland, Parish, and Hasse, from southern California, to mention only a few well-known figures. C. F. Sonne, G. P. Rixford, (Mary) Elizabeth Parsons, and Alice Eastwood were among the charter members resident in San Francisco. Miss Eastwood early assumed leadership in the club, the meetings being held nearly every week "to

study living plants, both native and exotic." From this more or less informal study group has come valuable collections for the Academy's herbarium. In this connection the collections of Evelina Cannon, Caroline L. Hunt, Mary C. Bowman, Dorothy (Mrs. E. C.) Sutcliffe, Ella Dales Cantelow, and others across the years, are notable.

Alice Eastwood first visited California in 1890 as a tourist, then returned the next year for a brief but active visit engaged in Academy affairs. In 1892 she joined the Academy staff as joint Curator of Botany with Mrs. Katharine Brandegee. Following Mrs. Brandegee's taking up residence in San Diego in 1894, Miss Eastwood became the Academy's Curator and head of the Department of Botany. . . . *Dux femina facti.*



The Eastwood Era at the California Academy of Sciences

BY CAROL GREEN WILSON

San Francisco

A new era destined to bring world-wide fame to the California Academy of Sciences in San Francisco began one morning in mid-May of 1891. That morning a 32-year-old former school teacher from Colorado climbed the marble stairs to the sixth floor botany workrooms of the new Market Street Academy building to call on Townshend Stith Brandegee, who had been botanist on Hayden's Exploring Expedition to southwestern Colorado in 1875. Alice Eastwood was ambitious to become a botanical writer. She laid her carefully marked specimens of California plants gathered during the previous winter in San Diego and Santa Cruz on the table of the little office to which Brandegee invited her to meet his wife, Katharine, at that time Curator of Botany at the Academy.

The fact that Mrs. Brandegee was probably the first woman in history to hold a senior curatorial position in such an institution did not concern Alice Eastwood at the moment. She had never heard then of the resolution offered by Dr. Albert Kellogg, one of the founders of the Academy, on August 3, 1853: "Resolved that we highly approve the help of females in every department of natural history and earnestly seek their cooperation"; nor did she dream that those words would help to shape her own destiny.

The important thing to her was to hear the pleased exclamations of these two scholars over her specimens. As they talked, her eye caught the glint of sunshine (*Baeria*) on the slopes of Twin Peaks glimpsed above the blue eucalyptus that filled the vacant lot next door to the Academy. She looked longingly across the intervening sand dunes at the patches of yellow daisies glowing among the other flowers that carpeted the peaks.

An invitation from the Brandegees to join their Sunday collecting excursions was eagerly accepted. She stayed in San Fran-

cisco long enough to join Mr. Brandegee on a trip up Mt. Tamalpais, little guessing how closely her own name would later be identified with that peak which stands sentinel above the Golden Gate. But she was rewarded even on that first climb by sharing a discovery with the scientist she had come so far to meet. The parasite, *Boschniakia*, which they found that day on the roots of a manzanita was considered so important that Mrs. Brandegee made a note of it in *Zoe*, the natural history magazine the Brandegees published in those early days, coupling Alice Eastwood's name with Mr. Brandegee's in the credit.

Miss Eastwood began shortly to contribute to *Zoe*. Although she returned almost immediately to Colorado, her descriptions of the plants and shrubs of southeastern Utah and western Colorado and her essay on the mariposa lilies — "so distinct, so individual that each seemed to say, 'I am myself; there is no other like me'" — intrigued not only the readers but also the editors.

In the winter of 1891-92, she was invited to return to help Mrs. Brandegee bring order out of the chaos of unmounted specimens recently moved to the new building. She became a member of the Academy on April 18, 1892, and a few days later, April 26, presided for the first time over a meeting of the California Botanical Club, the activities of which she was to direct for more than sixty years. Spring and summer, however, found her back among the columbines and Indian paintbrushes of her beloved Rockies. Then Mrs. Brandegee offered to donate her services to the Academy if Alice Eastwood would come back to California as joint-curator, receiving all of the \$75-a-month salary.

She came, in December, 1892. The January issue of *Zoe* named her as Mrs. Brandegee's successor, both as Curator and Editor. With assumption of that responsibility, she then commenced the years of service, broken temporarily by the San Francisco earthquake and fire of 1906, which gives her the longest record of any staff member in the hundred-year history of the institution.

Beginning in the spring of 1893, collecting trips took her across the deserts and valleys and up the mountain peaks that bloomed with treasures hidden from the less adventurous. She reveled in the vast sheets of wildflowers in the San Joaquin

Valley. Ignoring advice from old settlers, she made her way across the cattle trails of the Santa Lucia Mountains and up the forbidding coast from Pacific Valley to Monterey, accepting rides from rural postmen and borrowing horses from remote ranchers. Once she was lost among the pines above the shoreline and slept alone by her fire of sugar and yellow pine cones.

She loved the moisture-drenched forests of Mendocino County and tramped long miles through the neighboring counties of Lake, Sonoma, and Napa. Sometimes she joined the Blochmans of Santa Maria on adventurous horseback trips across the mountains of San Luis Obispo and Santa Barbara counties into the Carrizo Plain. In those last years of the old century, she became an authority on the manzanitas (*Arctostaphylos* species) of Mt. Tamalpais. Herbarium cases filled with rare specimens collected and often named by the intrepid woman who shared her knowledge and enthusiasm with her fellow workers and her companions in the Botanical Club.

Alice Eastwood was the only woman ever invited to membership in the Cross Country Club, a group of masculine hikers who spent their Sundays exploring the trails of Marin and San Mateo counties. Soon she joined other mountain-minded men on longer treks, once going as far as Tehipite Dome on the Middle Fork of the Kings River. She even climbed to the head of Canyon Creek in the Trinity Alps with three men in the hot August of 1901.

But she did not need to go so far from home to collect interesting plant life. In Laurel Hill Cemetery in San Francisco, she found and named a new species of trailing manzanita, *Arctostaphylos franciscana*. Her paper on the flora of the Nob Hill cobblestones was published in *Erythea*, the botanical journal of W. L. Jepson of the University of California.

Then, one April morning in 1906, she could not stop to watch the new flowers poking through the cobbles as she hurried down Taylor Street. Frightened citizens were dragging trunks over the stones as they fled earthquake-shaken homes, and she hastened on toward Market Street. She was ahead of all the Academy staff. By the time someone arrived with a key to the Museum entrance, the Fuller Paint Works on Mission Street, south of their building, was bursting into flames. Sparks were igniting awnings on nearby Fifth Street. The marble staircase was de-

molished, but she climbed to the botany workroom, fitting her feet cautiously into the bronze bannisters. Quickly she assembled the types she had segregated from the general herbarium in alphabetized boxes, and making an improvised "lift" of her work apron and the string she had squirreled away for emergencies, she clambered back down the ruined stairs. Her companion, Robert Porter, stayed above to lower the treasures, 1497 irreplaceable specimens! She also had her Zeiss lens which she had tucked into her pocket as she passed her desk, the only personal possession she saved. Even the autographed copies of her new book, "A Handbook of the Trees of California," stacked on the floor by her desk, were left to the flames.

In the closing words of that book lies a clue to Alice Eastwood's life philosophy. In explanation of its simple diction, she stated her purpose: "to help rather than to shine." Consistently she has lived out that motto all of her long life.

Following six years of homeless wandering, during which she increased her knowledge and capabilities by work and study in the Gray Herbarium and Arnold Arboretum in Cambridge, Massachusetts, the National Herbarium in Washington, D.C., and ten months of study at Kew Gardens, British Museum, and Cambridge in England, and at Paris in France, she returned to San Francisco in May of 1912.

The Academy was still in temporary quarters on Sansome Street when she undertook once more to bring order out of a chaotic jumble of gift collections stored in the basement and to rebuild a botanical library. Her own copies of the Botany of the Geological Survey of California and Gray's Synoptical Flora had been saved because she had loaned them to out-of-town botanists. With these and gift books she had the nucleus of the library that in the succeeding years she was going to do so much to help rebuild.

Before the Academy's North American Hall was completed in Golden Gate Park, she spent some months in the Yukon in 1914 at the instigation of Professor C. S. Sargent of the Arnold Arboretum, bringing back rare specimens from the northern lands to add to the increasing collections of California plants she was assembling for the Academy.

She had written in an article in Science in 1906, "my own

destroyed work I do not lament, for it was a joy to me while I did it, and I can have the same joy in starting it again."

That joy was shared by all whose lives she touched, plant-lovers and Botanical Club members in particular. John McLaren, Superintendent of Golden Gate Park, told her that he consented to the building of the new Academy Museum in the park largely because it would bring her and her work closer to him, so that they might cooperate in making the park an educational as well as a recreational area for the people.

First to profit by her generosity of spirit were the park gardeners. She gathered these men into evening classes so full of interest that the superintendent himself came often. He even gave examinations to his men, raising the pay of those who did well, from laborer to gardener status.

For the opening of North American Hall in 1916, Miss Eastwood had shelves installed at the entrance, and started a flower show, now the longest continuous exhibition of its kind in the world. Week after week she named and labeled the specimens she collected on Sunday hikes, as well as those brought her by Botanical Club members, horticulturists of the Bay area, and park gardeners.

Gradually the botany room above the exhibition halls became a center of scientific learning. When world-famed herbariums learned that Alice Eastwood was in charge again, gift and exchange collections poured in to augment her own. She was hostess to visiting celebrities who came to see her specimens and stayed to enjoy tea and cheese crackers while they lunched on workroom tables spread with newspapers for tablecloths.

She again began to write as well as to collect. A bibliography published on her 90th birthday reveals more than 300 articles from her pen, most of them published after she was 50. Honors have been heaped upon her through her advancing years. Flowers and shrubs bear her name, both botanic and common. Her influence has widened with the many organizations she has helped to form or nurture. The California Spring Blossom and Wildflower Association has, since 1923, spread love of flowers and lessons in conservation among the school children of the state. Alice Eastwood is Honorary Life President of this group. She is the "Sweetheart of the Business Men's Garden Club." The American Fuchsia Society exists because of her devotion

to the cause. The California Horticultural Society has relied upon her knowledge and shared enthusiasm. Nurserymen of the state have a catch phrase: "If you do not know what it is, send it to Miss Eastwood." The San Francisco Garden Club has established two perpetual scholarships in Floriculture at San Francisco City College in her name. As former president and a moving spirit in the Tamalpais Conservation Club, she shares the credit for saving "the Mountain" as a State Park.

Up the Redwood Highway, where she was wont to wander alone in the 'nineties in search of rare plants, she has long been a prime mover in the Save-the-Redwoods League. The Azalea Preserve near Arcata resulted from a trip she made with her friends, Mrs. Philip Van Horne Lansdale and Miss Isabella Worn in 1942.

But her vision is world-wide. Under her curatorship, the Academy herbarium was reestablished and developed on a world-wide basis. As she has said: "Looking forward to the future greatness of San Francisco, I wanted this new herbarium to be a great one, founded on a broad basis, a herbarium containing not only plants of North America, but of the whole world."

Since she was official hostess to the members of the International Phytogeographic Excursion on Mt. Tamalpais in 1913, her friendships among botanists have spread around the globe. She was welcomed as a delegate from the California Academy at the Fifth International Botanical Congress in Cambridge, England, in 1930, and again in 1935 at Amsterdam when she took her young assistant, John Thomas Howell, with her. Then in 1950, after her retirement at the age of ninety, she was invited to Sweden to be an Honorary President at the Seventh Congress. Flying to Stockholm alone, she symbolized for all who know her the truth of Dr. Carl Wolf's praise in a letter written for the Academy celebration of her 80th birthday: "No better plant than *Eastwoodia* could have been selected to bear your name, since it so aptly expresses your exceptional botanical career, exploration and study of plants in hard-to-get-at areas of the West. . . . Had Brandegee selected a plant from the protected forests or from some other region of sheltered habitat, he would of course, have honored you. But by selecting a plant from the arid foothills of the inner South Coast Ranges of California

where every plant must possess exceptional ability to withstand the rigors of an unfavorable environment, he honored you to a far greater degree."

At the postponed 94th birthday party sponsored by the California Spring Blossom and Wildflower Association on April 13, 1953, a project was launched to place the name of Alice Eastwood on a redwood grove. Aubrey Drury, responding to the announcement, carried Dr. Wolf's thought farther, for, he said, "the giant sequoia most aptly symbolizes your spirit of strength and longevity." As the Academy celebrates its hundredth anniversary, the life and philosophy of its Curator-Emeritus of Botany permeate plans for an Alice Eastwood Hall of Botany, which a grateful community proposes to erect in the park she loves so well.

These tangible tributes will keep her name alive for future generations, but she leaves a richer heritage for those who know her best. With a heart tuned from childhood to the message God has revealed through the order and system of nature she says in calm words of faith: "The older I grow the more certain I am of immortality. I am convinced that body and soul are two different entities. My spirit grows stronger with the years, but my legs won't take me where I want to go."

She has, however, started many others to carry on her quest. Alice Eastwood's greatest contribution to the world is not limited to specimens stacked in herbarium cases, nor to the accumulation of rare botanical books on the Academy Library shelves, nor even to the carefully written pages of her books and articles. It is in the thousands of lives who have been inspired to more constructive living through contact with a woman whose vital purpose, driving force, and acceptance of circumstances have made growing old a continuing proof of Robert Browning's prophecy, "the best is yet to be."



A Partial Gazetteer and Chronology of Alice Eastwood's Botanical Explorations

BY CAROL GREEN WILSON
San Francisco

The data assembled here are chiefly from types in the California Academy of Sciences, as well as from field note books kept by Miss Eastwood and Mr. Howell from 1906 to 1941. All of Miss Eastwood's notes and collections made prior to 1906 were destroyed in the San Francisco Fire of April, 1906, with the exception of the specimens that she saved or that were on loan, miscellaneous plants she had distributed to other institutions, and a Colorado collection now in the herbarium of the University of Colorado at Boulder. During the summers of the 'eighties she collected in the vicinity of Denver, Morrison, Georgetown, Grays Peak, Pikes Peak, Durango, Silverton, Ouray, Wet Mountain Valley, La Plata Mts., Mancos, and other places in Colorado. The most notable of these early expeditions was made in the summer of 1887 when she acted as guide for Alfred Russel Wallace in the ascent of Grays Peak.

The first section of the chronology and gazetteer, from 1890 to the San Francisco Fire, is presented chronologically; the second section, from 1906 to the outbreak of World War II when active collecting ceased, is presented geographically in a much-abbreviated form.

1890-1905

1890. COLORADO: Durango (June). CALIFORNIA: San Diego, Coronado (December).

1891. CALIFORNIA: San Diego and vicinity (January to March); Los Angeles, Pasadena, Sawtelle (April); Santa Cruz, San Francisco, Mt. Tamalpais,* (May). COLORADO: Gunnison (May); Denver and vicinity (June); Steamboat Springs, Flat Top Mts., Arkansas River Canyon above Cañon City (July). CALIFORNIA: San Francisco (December).

1892. CALIFORNIA: San Francisco and vicinity (January to May). UTAH: from Thompson's Springs through Montezuma Canyon to the San Juan River, stopping at Moab and Monticello (May and June). COLORADO: Navajo

*Trips to Mt. Tamalpais were so frequent that they will not be noted separately.

Canyon, Mesa Verde, Mancos (May and June); Johnson Canyon (August). CALIFORNIA: San Francisco (December).

1893. CALIFORNIA: Bakersfield, San Emidio (March); Huron, Alcalde, Lewis Creek, Warthan (Waltham) (May); Hood Mt. near Santa Rosa (with Luther Burbank), King City to Jolon, Pacific Valley, Big Sur (June); Mt. Shasta (August).

1894. CALIFORNIA: San Francisco (April); between Sanger and Sequoia Mills, Millwood (May); Ft. Bragg to Glen Blair, Pudding Creek (June); Mountain Lake in San Francisco (July); San Francisco Presidio (August); Colfax, Newcastle, Tehachapi, Lake Merced near San Francisco (September); San Emidio Canyon (October).

1895. CALIFORNIA: Kaweah, Fairfax (April); Laurel Hill Cemetery in San Francisco (May). UTAH: San Juan River, Barton's Range, Willow Creek, Butler Springs, Epsom Creek (July).

1896. CALIFORNIA: Cuyama, White Hills, Carrizo Plain, Dutard's Ranch, La Graciosa, Casmalia, Alamo Creek (May).

1897. CALIFORNIA: San Miguelito Ranch, Santa Lucia Mts., Stony Creek, San Antonio River (to collect 'flowers' of Santa Lucia fir for Prof. Sargent) (May). COLORADO: Cripple Creek (August).

1898. CALIFORNIA: South San Francisco (March); San Francisco (May).

1899. CALIFORNIA: Bodega Point (April); Point San Pedro, New Idria (May); South Fork of Kings River to Bullfrog Lake and Harrison Pass (July).

1900. CALIFORNIA: Clear Lake to Bartlett Springs (February); Pacific Grove to Cypress Point, Altruria, Mt. St. Helena (April); Calistoga (May); Bodega Point (July).

1901. CALIFORNIA: Pt. Reyes, Little Carson Creek (May); Redding to the head of Canyon Creek (July).

1902. CALIFORNIA: between Cahto and the Eel River (May); Carrizo Plain (June); Wawona, Snow Flat, Tioga Road (July); Laytonville, Red Mt., Mendocino Co. (August).

1903. CALIFORNIA: Mt. Diablo (February); Mt. Diablo, Alcalde (May); Mineral King and vicinity (July).

1904. CALIFORNIA: San Diego County, Santa Barbara County (April); Santa Catalina Island (May); Desolation Valley (July).

1905. CALIFORNIA: Smith River, Del Norte County (May); Rodeo Lagoon, Marin County (July).

1906-1941

PART I: Counties of California where plants have been collected by Alice Eastwood, and, from 1933 to 1941 by Alice Eastwood and J. T. Howell jointly, the years of joint collecting indicated with an asterisk.

ALAMEDA: 1915, 1921, 1922, 1926, *1935, *1938.

ALPINE: *1939, *1940.

AMADOR: 1921, 1924, *1940, *1941.

CALAVERAS: *1940, *1941.

COLUSA: 1921, 1922, *1936, *1940.
CONTRA COSTA: 1914, 1915, 1921, 1922, 1923, 1927, 1931, *1935, *1936.
DEL NORTE: 1907, 1912, 1923, 1928, *1934, *1936.
ELDORADO: 1906, 1909, 1927, 1934, *1935, *1940.
FRESNO: 1925, 1926, *1935, *1938.
GLENN: 1921, 1922, *1934, *1941.
HUMBOLDT: 1907, 1923, *1934, *1936, *1937.
INYO: *1940, *1941.
KERN: 1913, 1914, 1917, 1926, *1935, *1937, *1938, *1940, *1941.
KINGS: 1914, *1935.
LAKE: 1924, 1925, 1927, *1938.
LASSEN: *1940.
LOS ANGELES: 1906, 1913, 1915, 1917, 1919, 1920, 1922, 1928, *1937.
MADERA: 1924, *1938, *1941.
MARIN: 1906, 1912, 1913, 1914, 1915, 1918, 1923, 1924, 1925, 1926, 1934, *1936,
*1937, *1938, *1939.
MARIPOSA: 1907, 1915, *1938, *1941.
MENDOCINO: 1912, 1913, 1922, 1923, 1924, 1928, 1932, *1934, *1936, *1937,
*1938, 1939, *1941.
MERCED: 1915, 1927, 1930, *1938, *1941.
MODOC: *1940.
MONO: 1909, 1939, *1941.
MONTEREY: 1912, 1913, 1915, 1926, *1935, *1936, *1937, *1938.
NAPA: 1915, 1918, 1922, 1923, *1935, *1937, *1938, *1939.
NEVADA: 1912, 1913, 1932, *1937.
ORANGE: *1937, 1939.
PLACER: 1912, 1922, *1937.
PLUMAS: 1918, 1927.
RIVERSIDE: 1913, 1919, *1937.
SACRAMENTO: *1941.
SAN BENITO: 1917, 1918, 1919, *1936, *1937, *1938.
SAN BERNARDINO: 1913, 1916, 1931, 1932, *1938, *1940, *1941.
SAN DIEGO: 1913, 1920, 1932.
SAN FRANCISCO: 1912, 1914, 1927, *1937.
SAN JOAQUIN: 1917, 1921, *1935, *1938.
SAN LUIS OBISPO: 1926, 1927, 1928, 1929, 1935, *1935, *1936, *1937, *1938,
1941.
SAN MATEO: 1912, 1914, 1915, 1922, 1937, *1937, *1938, *1939, *1941.
SANTA BARBARA: 1906, 1907, 1916, 1917, 1926, 1929, *1937, 1939, 1940.
SANTA CLARA: 1921, 1922, 1923, 1924, 1927, *1935, *1937, *1938, *1941.
SANTA CRUZ: 1916, 1922, *1935, *1938, *1939.
SHASTA: 1912, 1923, *1934, *1936, *1940.
SIERRA: 1918.
SISKIYOU: 1912, 1917, 1921, 1922, 1923, *1934, *1936, *1937, *1940.
SOLANO: 1913, 1920, 1921, *1940.
SONOMA: 1915, 1921, *1934, *1936, *1937, *1938, *1939, *1940.
TEHAMA: 1912, *1934, *1940, *1941.
TRINITY: 1921, *1937.

TULARE: 1914, *1938.
TUOLUMNE: 1907, *1939, *1940, *1941.
VENTURA: 1916.
YOLO: 1927.
YUBA: 1913, 1921.

PART II: States and provinces in Canada, Mexico, and United States (except California) where Alice Eastwood has collected and where Alice Eastwood and J. T. Howell have collected jointly, the years of joint collecting marked by an asterisk.

ALASKA: 1914.
ARIZONA: 1913, 1916, 1917, 1919, 1928, 1929, 1930, 1931, *1933, *1938, 1940.
BRITISH COLUMBIA: 1914, 1920.
COLORADO: 1910, 1916, 1918, *1938.
IDAHO: 1925, *1936.
LOWER CALIFORNIA: 1913.
NEVADA: 1927, *1933, *1938, *1940, *1941.
NEW MEXICO: 1916, 1919, 1928, *1938.
OREGON: 1914, *1934, *1936, *1940.
UTAH: 1918, *1933, *1938, *1941.
WASHINGTON: 1914, 1920, 1925, *1936.
YUKON: 1914.



A Century of Achievement

BY PHILIP A. MUNZ

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On page one of volume one of the Proceedings of the California Academy of Sciences* was reported the meeting of September 4, 1854. This was not the first meeting of the Academy, that having been held on April 4, 1853, but in this first one described in the Proceedings it was stated that Dr. Albert Kellogg exhibited a drawing and specimens of a wild plant, *Frankenia grandifolia*, and that Mr. W. J. Steene presented a curious specimen of cabbage, which, "instead of a head formed of leaves in the usual manner, has a globular head formed by an enlargement of the top of the main stock, five inches in diameter, and weighing some two pounds or more." To me it is significant that from the beginning the interest of the members of the Academy extended both to native and introduced plants. The Academy's first president, Dr. Andrew Randall, for example, offered a prize of fifty dollars as early as July, 1853, for the best essay on trees and plants suitable for cultivation in California. I emphasize this, since the tradition has continued to the present. Miss Eastwood and, more recently, Miss McClintock, have devoted considerable time to the study of exotic plants. Thus, botanically the California Academy has maintained a broad interest in plants through the entire century of its activity.

In the present paper I shall confine my attention to two aspects of this century of achievement: (a) contributions to botanical literature and (b) expeditions and field work. It is my intention to report on these together in chronological order, since the two topics are closely interwoven. From the first, Dr. Kellogg, Mr. H. G. Bloomer, Mr. H. N. Bolander, Dr. John A. Veatch, and other members were active field men. They either brought in to the meetings material they collected themselves or that which was sent to them. Dr. Veatch lived at Red Bluff, Wm. A. Wallace in Los Angeles, J. N. Hume at Humboldt Bay, Henry Bates at Shasta City, C. D. Gibbes at Stockton, Joel Clayton in

*Known as California Academy of Natural Sciences until 1868.

Mariposa County, J. G. Swan in Washington Territory. They could easily pick up new and interesting plants almost at their very door. Dr. Kellogg was the principal student of these collections and described many new species, although new names were proposed also by Dr. H. H. Behr and by Bolander. Naturally enough, many of these new names later fell into synonymy, since with inadequate library and herbarium, it was impossible always to know what had been discovered earlier. But any modern book on the California flora shows a large number of names still in use, which originated in the early numbers of the Proceedings of the California Academy, for examples: *Lilium pardalinum*, *L. parvum*, *L. Washingtonianum*, and *L. maritimum*; and *Lupinus luteolus*, *L. citrinus*, *L. Stiversi*, *L. confertus*, *L. caudatus*, *L. cervinus*, and *L. sericatus* — to name but a few in two genera.

In addition to such local plants more distant species came in for study by members of the Academy. Dr. Veatch was a geologist and in 1854 visited Lower California as well as Cedros Island off the coast, collecting plants and sending them to Dr. Kellogg. Many of these were new to science and were published from time to time in the Proceedings. They included among others the remarkable new genus *Idria*, a relative of *Fouquieria*. While Dr. Veatch's journey to Lower California was not an expedition financed by the Academy, his collections came to that institution and thus interest in that region began early, as did that in the islands off the California coast. In fact the first new species that I find described in the Proceedings of the Academy is *Lavatera assurgentiflora* Kellogg from Anacapa Island (1: 14,—1854).

In 1860 Kellogg began publishing illustrations with the descriptions of many of his new species. I am sure that many recent botanists have found these drawings useful, even though they seem quite stylized as judged by our present standards. A somewhat later development in the Proceedings of the Academy was papers of a more inclusive nature, for example, "Different varieties of Eucalyptus, and their characteristics" by Kellogg (6: 30–38,—1875), and a series by Bolander: "Enumeration of shrubs and trees growing in the vicinity of the mouth of San Francisco Bay" (3: 78–83,—1863), "Remarks on California trees" (3: 225–232,—1866), "The genus *Melica* in California" (4: 101–

104,—1870), "The genus *Stipa* in California" (4: 168—170,—1872), and "Remarks on the genus *Lilium*" (5: 204—208,—1874). Articles began also to appear that were written by botanists from outside California. The first of these which I find is Asa Gray's "Descriptions of new Californian plants—No. 1" (3: 101—103,—1864).

The first series of the Proceedings ran through seven volumes and covered the years from 1854 through 1876. From 1877 to 1884 there was no regular publication, but in February of that year was issued number 1 of the Bulletin of the California Academy of Sciences. On pages 4 and 5 was a short paper by Asa Gray entitled "*Veatchia* nov. gen. *Anacardiacearum*" for *Veatchia cedrosensis* which had been described in the Proceedings (2: 24) as *Rhus Veatchiana* by Kellogg. Gray wrote, "We may dedicate this genus to the memory of its discoverer, the first and perhaps still the only botanical explorer of Cedros Island."

The Bulletin did not report the meetings of the Academy as had the earlier Proceedings, but consisted entirely of scientific papers. During the years of no publication there had been a great change in the personnel connected with the Academy; and the Bulletin, while containing a few short articles by Behr and by Kellogg, is mostly devoted (so far as botanical contents go) to the writings of E. L. Greene, Mary K. Curran, T. S. Brandege, and H. W. Harkness. Greene's first paper (1¹: 7—12) is entitled "New plants of the Pacific Coast," in which are described twelve new species. Some of these had been proposed by, or at least collected by, Kellogg; others were his own. *Eriogonum arborescens*, for instance, was based on specimens taken by Kellogg and Harford on Santa Cruz Island in 1874. *Brickellia multiflora* had been collected by Kellogg in Kings River Canyon in 1866. *Gilia heterodoxa* was taken by Greene himself at Calistoga in 1881 and 1883. All this goes to show that by 1884 the Academy must have accumulated a considerable herbarium rich in types and historical collections.

Greene's first paper was followed by a short one by Mrs. Curran (1¹: 12—13), describing three new species of flowering plants, and by the first in a new series in mycology. These were by Dr. Harkness in collaboration with several specialists: M. C. Cooke and H. W. Harkness, "Fungi of the Pacific Coast" (1¹: 13—20); William Phillips and H. W. Harkness, "Fungi of Cali-

fornia" (1¹: 21–25); C. B. Plowright and H. W. Harkness, "New species of Californian fungi" (1¹: 26); J. B. Ellis and H. W. Harkness, "New Californian fungi" (1¹: 26–29), and H. W. Harkness, "New species of Californian fungi" (1¹: 29–47). In 1885 appeared E. L. Greene's "Studies in the botany of California and parts adjacent" (1³: 66–127), giving synopses of a number of genera like *Sidalcea* and *Mimulus*. Mrs. Curran (1³: 128–151) summarized the species that had been proposed by Kellogg, Behr, and Bolander and gave her opinion as to their identity. Subsequent workers may not always agree with her opinions, but the paper is valuable, since she had before her the original material on which the species had been based. She published also for the first time a number of Kellogg's illustrations.

Following Mrs. Curran's paper is a long series of important contributions to western botany by Curran, Greene, Brandegee, and Harkness. In many cases the species described, especially by Greene, were not accepted by Gray and later writers. It is interesting to note, however, that with the more intimate knowledge of the California flora that has been developed in recent years and with the growing awareness of local subspecies and ecotypes, many of Greene's proposed species are found to have some status, if not always specific.

The two volumes of the Bulletin covered the years 1884 to 1887. Notable articles in 1887 are by Joseph Le Conte on "The flora of the coast islands of California in relation to recent changes of physical geography" (2: 515–520), by C. C. Parry on "The Pacific Coast alders" (2: 351–354) and "Californian manzanitas" (2: 483–496), and by Francis Wolle on "Desmids of the Pacific Coast" (2: 432–437).

In 1889 the Proceedings of the Academy were resumed as Series II, which ran through six volumes, 1889 to 1897. Known by this time as the outstanding scientific institution of the West, the Academy published not only papers by its own staff and members (Behr, Brandegee, Curran, Harkness) but by several eastern American and European specialists. We find contributions by William Trelease, "Synoptical list of North American species of *Ceanothus*" (1: 106–118,—1889); by C. F. Millspaugh, "Contributions to North American Euphorbiaceae" (2: 217–230,—1889); by L. H. Bailey, "New Californian Carices" (3: 104–106,—1891); by D. H. Campbell, "Prothallium and embryo of

Marsilea vestita" (3: 183-203,—1893); by A. Cogniaux, "Cucurbitacearum novum genus et species" (3: 58-60,—1891); by M. E. Jones, "Contributions to western botany, No. VII" (5: 611-732,—1896); and by Dr. Stizenberger, "A list of Lichens collected by Mr. Robert Reuleaux in the western parts of North America" (5: 535-538,—1896).

The last papers that I find by Mrs. Curran (by that time Mrs. Brandegee) were in volume 4: "Studies in Portulacaceae" (pp. 86-91,—1894) and "Studies in Ceanothus" (pp. 173-222,—1894). The first one by her successor, Alice Eastwood, appeared in the same volume (pp. 559-562,—1895) and was on "Two species of *Aquilegia* from the Upper Sonoran Zone of Colorado and Utah." From that time forward her articles on western plants formed an important part of the Proceedings.

Series III of the Proceedings were divided into fields of science, Botany having two volumes, the first from 1897 to 1900 and the second from 1900 to 1904. This botanical series was edited by Profs. Dudley and Campbell of Stanford University and by Prof. Setchell of the University of California. The papers range widely as to subject: on morphology and anatomy by D. H. Campbell, W. A. Cannon, and G. J. Peirce; on cytology by E. S. Byxbee, H. T. Hus, A. A. Lawson, and W. J. V. Osterhout; on algae by H. T. A. Hus, C. P. Nott, and D. A. Saunders; on fungi by H. W. Harkness; on lichens by G. J. Peirce; and on flowering plants by A. Eastwood, S. B. Parish, and C. Purdy. Having used some of the above papers, especially those by Purdy and Eastwood, I knew something of the content of these two volumes, but I must confess that until now I have had no real concept as to their scope and diversity of subject.

Series IV of the Academy Proceedings reverted to the more general scheme used in Series II and has contained papers in many fields of natural science. It began after the fire of 1906 which virtually wiped out the Academy's library and natural history collections. It differs from the earlier series in consisting largely of reports on exploring expeditions sent out by the Academy, particularly to the islands off the coast of Mexico and as far south as the Galápagos Islands. Apparently the first such expedition was in 1903 in a small schooner, the *Mary Sachs*. It went along the west coast of Lower California and to the Revillagigedo Islands. A botanical collector, Frederick E. Barkelew,

accompanied the expedition and got some material, but with rather uncertain geographical data, so that these specimens, as reported by I. M. Johnston (20: 14,—1931), were of questionable value.

In 1905-06 the Academy sent the first of its expeditions to the Galápagos Islands, on the schooner *Academy*, with Alban Stewart as botanist. The group of eleven men left San Francisco on June 28, 1905, and spent a year in the archipelago. Stewart later identified this collection at the Gray Herbarium. He contributed three papers to the first volume of the fourth series of the Academy's Proceedings: "A botanical survey of the Galápagos Islands" (pp. 7-288), "Notes on the botany of Cocos Island" (pp. 375-404), and "Notes on the lichens of the Galápagos Islands" (pp. 431-446). In his botanical survey of the Galápagos Islands he not only catalogued the plants known to occur and described newly discovered species, but discussed the botanical regions of the islands, the origin of the islands and of their remarkable flora, and gave a bibliography. Thus he established the knowledge of this flora on an entirely new basis.

In 1921 the Academy dispatched an expedition to the Gulf of California on the gasoline schooner *Silver Gate*, with I. M. Johnston as botanist. Work began April 17 on San Pedro Nolasco and continued until July 10 when the party reached Guaymas. Various spots on the coast of Sonora, on the peninsula of Lower California, and on the islands in the Gulf of California were visited. In 1924, the botanical results of the expedition were embodied in papers by W. A. Setchell and N. L. Gardner on "The marine algae" (12: 695-949) and by I. M. Johnston on "The vascular plants" (12: 951-1218). Very little had been known about the marine algae of the Gulf. The Setchell-Gardner report covers an 1890 collection made for the Academy by T. S. Brandegee and W. E. Bryant and another by Dr. and Mrs. Marchant in 1917, as well as the very large 1921 collection by Johnston. One hundred forty-four species and varieties were treated, of which one hundred eleven were new to science. Johnston's paper gave an account of the history of botanical work in the area and discussed the geology, climate, phytogeography, ecology, and origins of the biota. His catalogue of the plants gave in many cases a revaluation of the species covered. The paper is an important contribution to the botany of this and of adjacent areas.

Another ambitious Academy undertaking was the expedition to the Revillagigedo Islands off western Mexico in 1925 on the U.S.S. *Ortolan*. Leaving San Francisco on April 15, the party worked on these islands from about April 26 to May 24. The botanist was H. L. Mason. Miss Eastwood published on the collections made at various points visited other than the Revillagigedo Islands, such as Guadalupe Island, Tres Marias Islands (Maria Madre, Maria Magdalena, and Isabella islands), as well as some localities on the mainland. Her paper (18: 393-484,—1929) is divided into sections: one for Guadalupe Island, including a consideration of the Hanna and Slevin specimens of 1923; one for Cedros Island; one for Tres Marias Islands; others for Cape San Lucas, Magdalena Bay, Turtle Bay, San Quintin, and San Martin Island. It sums up what was known of the botany of each place. The collections from the Revillagigedo Islands were reported by Setchell and Gardner: "Marine algae" (19: 109-215,—1930), and by I. M. Johnston: "The flora of the Revillagigedo Islands" (20: 9-104,—1931). These islands had not previously had a detailed floristic study. Johnston reported one hundred twenty-one species and subspecies of vascular plants, of which thirty-seven were endemic. He made an analysis of the non-endemics and their affinity and of the origins of the flora as a whole.

The most recent great expedition in behalf of the California Academy of Sciences was the Templeton Crocker Expedition to the Galápagos Islands in 1932. It left San Francisco March 10 on the yacht *Zaca* and returned September 1. John Thomas Howell was botanist. So far it has led to seventeen botanical papers in the Academy Proceedings: those on flowering plants by A. S. Hitchcock, J. T. Howell, and H. K. Svenson; on bryophytes by E. B. Bartram, Lois Clark, and M. A. Howe; on lichens by O. V. Darbishire and D. H. Linder; on fungi by Lee Bonar; and on algae by Setchell and by Setchell and Gardner.

A less important Crocker expedition to western Polynesian and Melanesian islands in 1933 led to a short report by Setchell on some marine plants (21: 259-276,—1935).

Outside of the various reports mentioned above, Series IV of the Proceedings contains a number of other papers that should be mentioned as botanical or as having botanical implication. Of these, several are by Miss Eastwood: "New species of Ceano-

thus" (16: 361-364,-1927); "The escallonias in Golden Gate Park, San Francisco, California, with description of new species" (18: 385-392,-1929); "New species of plants from western North America" (20: 135-160,-1931). Others were by writers not on the staff of the Academy, but were usually based at least in part on the collections of the Academy: A. W. Evans, "Notes on the Hepaticae of California" (13: 111-136,-1923); H. M. Hall and J. Grinnell, "Life-Zone indicators in California" (9: 37-68,-1919); P. A. Munz, "The Antirrhinoideae-Antirrhineae of the New World" (15: 323-398,-1926); D. D. Keck, "A revision of the genus *Orthocarpus*" (16: 517-572,-1927); E. Walther, "A key to the species of *Eucalyptus* grown in California" (17: 67-88,-1928); R. C. Barneby, "A revision of the North American species of *Oxytropis* DC." (27: 177-312,-1952).

Volume 25 of Series IV was dedicated to Alice Eastwood in honor of her completion of a half century of devoted and able service to the California Academy. In addition to a biography of Miss Eastwood it contains a bibliography of her writings to 1949. This list is notable in revealing the large number of papers contributed by Miss Eastwood while a staff member of the Academy to journals not published by that institution, including *West American Scientist*, *Zoe*, *Erythea*, *Bulletin of the Torrey Botanical Club*, *Botanical Gazette*, *Torreya*, *Muhlenbergia*, *Contributions of the Gray Herbarium*, *National Horticultural Society Magazine*, and others. These papers are a part of the achievement of the Academy, a contribution to botanical science made possible by its funds and collections. To a lesser extent the same is true of the writings of Mr. Howell and Miss McClintock in more recent years, as evidenced by "The Marin Flora" of the University of California Press, and by papers in the *Wasmann Journal of Biology*, *Journal of the California Horticultural Society*, and *American Midland Naturalist*, to mention only three.

The Eastwood Semi-centennial volume consists of eighteen papers by as many botanists (mostly western): Babcock, Barneby, Benson, Campbell, Ewan, Goodspeed, Howell, Keck, Mc-Minn, Mason, Munz, Peirce, St. John, Setchell, G. M. Smith, Stebbins, Wiggins, and Wolf. The wide variety of subjects covered deal with: endemism in *Crepis*, *Astragalus*, Arizona cacti, relations of temperate floras of North and South America,

Datura, *Nicotiana*, *Phacelia*, *Artemisia vulgaris* complex, hybrids in *Ceanothus*, paleobotany, *Fuchsia*, water and plant anatomy, endemism in Hawaii, *Ruppia*, marine algae of Monterey, hybrids in *Bromus*, *Drymaria*, and a hybrid oak.

From time to time, as a distinct series, the California Academy has published "Occasional Papers." From the botanical standpoint the most notable of these was number 9 by Alice Eastwood, entitled "A Handbook of the Trees of California" (pp. 1-86,—1905). Issued just before the fire of 1906, it has become almost a collector's item since most of the stock was burned.

One of the most important botanical contributions of the Botany Department of the Academy in recent years has been the journal, LEAFLETS OF WESTERN BOTANY. Privately published by its founders and editors, Alice Eastwood and John Thomas Howell, and more recently by the latter alone, and receiving some financial help from the California Botanical Club, it has nevertheless for the outside world a definite connection with the Academy. Founded in 1932, it is now in its seventh volume and consists of about 1600 pages, mostly on western plants, native and cultivated. There is a vast amount of material in these pages, especially in the way of distributional and nomenclatorial notes and of short revisions. The papers are by many authors as well as by Miss Eastwood and Mr. Howell.

All told, the California Academy of Sciences has lived through a century characterized first by botanical exploration of California and the West, later of regions farther to the south, where the concentration has been on Lower California, adjacent islands, and the Galápagos Islands. A number of expeditions has assembled materials and numerous papers have reported the findings. Those collections made during the past half century are still intact and are available at the Academy for study and consultation. Duplicate specimens have enriched the collections of many other institutions. Printed volumes have gone over all the world and made available a tremendous body of knowledge concerning the botany of vast stretches of the Pacific Coast. This knowledge is important to the monographer, to the geographic botanist, and to workers in other fields. Meanwhile the Academy has built up a library and an herbarium of outstanding importance. These are visited by botanists from near

and far, for shorter or for longer periods, who use the materials and consult the curators, always to gain information or help in one way or another. The Academy is also the chief botanical headquarters for a small but important group of botanists not on its payroll, who find there a place for work and who add greatly to its contribution to science. I refer to such men as the late J. W. Stacey, Eric Walther, Lewis S. Rose, Dr. T. H. Kearney, and younger students who get inspiration and training, like Peter Raven and Peter Rubtsoff.

Finally, brief mention should be made of botanical activities by members of the Botany Department staff for the Bay region communities, such as lectures to garden clubs and other organizations, radio programs, identification of specimens for gardeners and others, and classes in plant taxonomy. These efforts, as well as the research and publications of the staff, all combine to make the California Academy of Sciences an important botanical center and one that well maintains the tradition of a century of great accomplishment.



Horticulture and the California Academy of Sciences

BY VICTOR REITER, JR.

San Francisco

It is somewhat presumptive for a layman only half the age of the California Academy of Sciences to present an evaluation of the Academy's contribution to his professional field. But, in a way, an impression may best be presented by one not too closely associated with the botanical activities of the Academy.

Ornamental horticulture is a field which stems from practical applications of many arts and sciences, not the least of which is botany. Since basically it is an art that deals with plants, and botany is the science dealing with plants, it logically follows that horticulture must consider botany as one of its cornerstones. Every plant cultivated can be traced back to some wild form somewhere in the world. Indeed, even our most accursed weeds must be considered as plants in the wrong place. If we want to study any of these garden plants, good or bad, we must turn to the classification of plants in botany or we find only chaos.

The writer having been a nurseryman for many years has been aware of the misconceptions about plants in the minds of the average person. Having been engaged in growing plants often without common names, he knows how correct botanical terminology can create laughter and even criticism. The attitude that Latinized names are amusing and that their use is a stilted pose is fortunately waning, but we still have a sprinkling of those good citizens who mistrust anything as technical as the botanical names of plants.

If nurserymen have recognized this attitude of mistrust for botanical terms, the professional botanist must certainly have his problems when translating his field for lay consumption. Winning over the layman to the commonplace use of botanical terms is essential to botanical and horticultural education. The awareness by the Academy's Department of Botany of this need for talking down to the lay level has helped tremendously in

popularizing correct nomenclature. In the author's lifetime he has seen geraniums become *Pelargonium*, cranesbills become *Geranium*, syringas become *Philadelphus*, and lilacs become *Syringa*. Indeed, all of California's ornamental horticulture has undergone an inspiring metamorphosis in his lifetime, thanks to the influence of scientific organizations with enough public confidence to influence the lay outlook.

The purpose of this paper is not to trace the development of ornamental horticulture in California but rather to recognize the contribution of the California Academy of Sciences to that development. Personally the writer believes that the Academy has contributed its full share to this progress in the past and that it is singularly equipped and staffed to continue its task of enlightenment.

In all probability the early influence of the Academy on ornamental horticulture was slight. The primary botanical task in a new country is the classification and the recording of the discoveries in the native flora. In a new community ornamental horticulture is usually primitive compared with its agriculture and economic horticulture. The aesthetic refinements grow with the maturity and the leisure of the community. Yet, if it were not for the pioneering vision of such venerable institutions as the Academy, the precious scientific data essential to progress would not be in readiness when the community attains a sufficient development to need this knowledge.

We know that there was considerable interest in plants from 1860 to 1890 and that many of our finest garden subjects had already been introduced from the far corners of the earth before 1900. Outstanding private collections of exotics were grown and the traveler today can still see old specimens of the early importations scattered over the state.

The Academy from its inception had a share in this early interest in exotics but it was not until Alice Eastwood became head of the Department of Botany that ornamental horticulture had its champion. We know from her notes that Miss Eastwood was interested in cultivated exotics "before the fire" (1906), but in 1915 as Curator of Botany in the Academy's new home in Golden Gate Park, she was able to make this interest a special feature in developing the new herbarium. It is this valuable herbarium collection that is so important to California horticulture today.

The major botanical role of a California institution should be the study of the native flora, but to those in horticulture the cultivated flora of gardens (which for the most part is exotic) is of primary importance. The native flora has certainly not been neglected at the Academy, but the addition of this broad interest in cultivated exotics has been a unique and valuable boon for the plant-conscious California gardener and it has welded the common interests of local horticulture and botany much more intimately.

Highly specialized botanical workers sometimes become so engrossed in their own narrow field that they lose touch with wider horizons and with the public. Fortunately for all of us, Miss Eastwood, a specialist in certain aspects of the California flora, was able to see beyond her immediate specialty and to initiate an important service to horticulture. Not only did she establish the herbarium of cultivated exotics but she was able to accumulate a library which includes many books necessary for their study. The present facilities, although crowded, have the essentials of a fine horticultural study center. Suffering from financial limitations and the inconvenience stemming from inadequate housing, the Academy's facility remains one of the best in the West. Certainly there is nothing to equal its herbarium of cultivated plants west of the Rockies and perhaps west of the Atlantic seaboard.

Isolated in a remote wing of the Academy buildings and designed for professional research rather than public participation, this priceless equipment has not served on as broad a base as it deserves. Few people are aware of the constant plant identification service that goes on here and of the slow gradual accretion of plant knowledge being sifted and classified for future workers. Under Miss Eastwood's guidance the Academy has built a horticultural herbarium of the first rank. Miss Elizabeth McClintock has been in charge of this collection since Miss Eastwood's retirement and the same appreciation of its importance is accorded it by this new curator. Horticulturists are encouraged to see the high professional standards continued in the maintenance and expansion of this work.

In stimulating the union of horticulture with botany an awareness of the need for this union had to be created by the participation of the Botany Department in activities beyond its

normal sphere. Not only did Miss Eastwood recognize and assist groups in horticulture but it is encouraging to note that the program she established is being continued since her retirement. Since 1892 Miss Eastwood has been leader of a study group, the California Botanical Club, and was a founder of the California Spring Blossom and Wildflower Association. The writer, who is a fuchsia breeder, is keenly aware of the importance of Miss Eastwood's work in putting on firm foundation the American Fuchsia Society and of the stature that the society gained through its contact with the Academy. During its incubating period (1933), the California Horticultural Society held its second meeting in the herbarium of the Academy. Today, the society is fortunate in having Mr. Howell assist in maintaining the botanical accuracy of its Journal, while Miss McClintock, who is also serving at present as secretary of the society, keeps the names listed in its monthly Bulletin correct.

Flowers have been exhibited in the foyer of the Academy's North American Hall since its opening in 1916. At that time Miss Eastwood began to display vases of cut flowers with botanical as well as common names affixed. Among those drawn to these exhibits was Mr. Eric Walther, the present Supervisor of the Strybing Arboretum in Golden Gate Park. Mr. Walther subsequently became one of Miss Eastwood's staunchest students and one of the leading horticultural authorities of the Pacific Coast. The liaison between the park's plantings and the Academy's botanical facilities has always been close. Until 1931 Miss Eastwood conducted classes for the park gardeners, an undertaking which fell to Mr. Walther in later years. When funds for the Strybing Arboretum were left to the city it was specified that the plantings should be in close proximity to the Academy, a fortunate stipulation. The work of the arboretum would be very materially handicapped without the technical facilities available at the Academy and the horticultural herbarium of the Academy has profited from its proximity to the rare plantings of the arboretum and of Golden Gate Park generally. The convenience of having a reference library near the actual growing plants has been a tremendous stimulus. The beautiful color plates in the volumes of the Academy's botanical library have inspired Mr. Walther and others to acquire many of the plants pictured and our park as well as California gardens are showing

the influence of this library in their richer plantings. While the horticultural specimens in the herbarium have been collected by a number of people, the largest proportion of them have been collected by Mr. Walther, not only in San Francisco and the Bay area but also in southern California.

Then, too, Miss Eastwood has published papers and articles on various groups of cultivated plants whose nomenclature was confused, such as those dealing with the bottlebrushes, escalonias, and pittosporums. These papers, published in LEAFLETS OF WESTERN BOTANY, have often exposed plants masquerading under wrong names, bringing to light the absence of the true varieties in our collections and making it possible to import them. More recently, Miss McClintock has contributed a series of articles to the Journal of the California Horticultural Society which deal with perplexing problems in California horticulture.

The unusual combination of interests in both the native flora and in horticulture that Miss Eastwood has shown has been a real influence in the development of the use of California natives in gardens here and elsewhere. The professional and horticultural relations between such institutions as the Rancho Santa Ana Botanic Garden, the Santa Barbara Botanic Garden, and the Strybing Arboretum have been intensified by Miss Eastwood's association and friendship with the staffs of these institutions. That the garden value of native plants has not been overlooked and smothered by the formal botany essential to the scientist is something for which horticulturists should be grateful. This appreciation of California natives for California gardens which Miss Eastwood has always had is beginning to bear fruit.

In recent years publicly supported institutions such as our universities and colleges have taken over many orphan activities like botanical gardens, plant testing, and training of horticultural personnel; and even state tribute on horse racing has been turned to flower show support. In the face of all these diverse activities deriving funds from public sources, privately endowed institutions with their spartan budgets find it hard to be heard over the din of publicity accorded the state-supported giants. Yet when we see, as at the Academy, the development of a facility so valuable to horticulture, one carried on with such

a small staff and at so little cost, we wonder if the community fully appreciates the service it has been getting.

Here in San Francisco we have the finest horticultural herbarium in the West, the botanical library necessary for its proper utilization, a personnel qualified to carry on the program, and the tradition of a fine institution. All of this is centered in Golden Gate Park which contains one of the richest and most diversified collections of living plants in the country. Certainly these facilities deserve all the support that the horticultural community of the San Francisco Bay area can give them and in return I am confident ornamental horticulture will benefit many-fold.



Books and Botany

BY VERONICA J. SEXTON

San Francisco

It is most proper to give the major credit for the development and growth of the outstanding collection of botanical books in the California Academy of Sciences Library to Miss Alice Eastwood. For fifty-five years she worked with a single objective in mind, to make it the best possible tool for her purpose, and she continues to have a keen interest in it to the present time. The Academy was forty years old when she came to it, drawn from her beloved Colorado chiefly because of its great book collection. When she came within the influence of this lodestone of books which had been gathering for four decades from all parts of the scientific world, she settled down for her life work, and her precise knowledge of source material broadened with her association with Mr. and Mrs. Brandegee, who were far advanced in a knowledge and appreciation of botanical literature.

There is little evidence left of the holdings of the Academy's botanical books before 1906. Perusal of a short list in the "Catalogue of the Library . . ." and its supplement issued in 1889 gives an inadequate picture of what eye-witnesses assure us was a great library for its time. Our knowledge of its strength of holdings in the reports of voyages, in the great monographic and floristic classics, and in the proceedings of learned societies, is largely based on Miss Eastwood's memory of them. She has often mentioned books or sets which have never been replaced, and she has expertly compared the merits of the collection before and after the fire. The interests of the history of botany must have been well served by the great pre-Linnean library owned by the Academy and conceded to have been the greatest in North America. Miss Eastwood never grieved over its loss as some of us do today, for she was completely immersed in her own work in West American botany and the literature that would contribute directly to it. Between 1902 and 1906 she was active in library organization when a Library Committee was functioning. The fabulous 1902 library budget of \$2200 was

due undoubtedly to her aggressive policy in a cause in which she believed so fervently.

In little more than a decade after her coming to the Academy, the first results of her efforts were wiped out by the fire of 1906. Shortly thereafter she set out on her travels and in the course of her research while the Academy was re-organizing she came to know intimately great botanical libraries on the east coast and in Europe. Upon her return to San Francisco in 1912 she had a well-defined plan and renewed enthusiasm for rebuilding the library.

At this time Miss Eastwood was appointed Academy Librarian and she gave unstintingly of her time and energy to forward her charge. In the mornings she came long before opening time for her own department in order to lay out work for her library assistant. Doctor Emmet Rixford and perhaps others too were present early and late unpacking and arranging the shipments that were pouring in. Societies and governments were replacing their sets of journals and reports. Sympathetic authors and publishers were sending their works. One of these most treasured to this day by Miss Eastwood was the replacement of Engler and Prantl by the publisher, Wilhelm Engelmann of Leipzig. The Academy of Natural Sciences of Philadelphia sent its duplicates in generous quantities, and the same is true of the American Academy in Boston, and of others.

Friends and admirers of Miss Eastwood have found her devotion to books infectious, and by her example or through her influence have presented valuable gifts to the Academy library. Through Miss Eastwood's good offices, Lindley's magnificent folio *Sertum Orchidaceum* was given to the Academy by Mrs. Karl H. Karg as a memorial to her husband. More recently the botanical library of Mrs. Dorothy Sutcliffe was willed to the Academy and to the California Botanical Club. It was Miss Eastwood who attracted the princely bequest of the late William F. Herrin which included among other things complete sets of Curtis's *Botanical Magazine* and Loddige's *Botanical Cabinet*.

Similarly Miss Eastwood influenced the purpose to which the income from the Mrs. William Hinckley Taylor Fund of the Academy is to be devoted. This fund was raised for the Academy by the San Francisco Garden Club in honor of its founder and first president, Mrs. William Hinckley Taylor, and at the

suggestion of Miss Eastwood the garden club board directed that the income be used to purchase books for the Botany Department. Several works of great beauty and worth have already been acquired by this means, the outstanding one being Elwes' Monograph of the Genus *Lilium*, complete with its seven supplements (which, as a further gift from the fund, have been handsomely bound to match the binding of the original).

Miss Eastwood has been the inspiration and directing force in building up the library of the California Botanical Club which is shelved in the Botany Department. This library she developed along two lines: one of popular or semipopular works on botany, horticulture, and botanical travels primarily for the use of the club; the other of more technical taxonomic works, such as Sweet's Geraniaceae and Millais' Rhododendrons, primarily for reference in the Botany Department. From time to time she has had the club present to the Academy one of its more valuable works as a token of appreciation to the Academy for what that institution does to foster and further the aims of the club.

With the exception of other special gifts, the regular exchange accounts, and some meager purchases, the costs of developing the botanical library over the years have been met by Miss Eastwood. She has lived frugally, and sometimes austere, in order to meet bills for rare books. She has often made the remark, "Save in order to be generous"; and this motto she has carried out implicitly. She has always had cash on hand when a book, long sought after, has appeared on the market. She has had an uncanny ability as a book-buyer. True, she might gamble and bargain and at length compromise rather than lose an opportunity, but she never allowed price to defeat her great objective, namely, to acquire at the first reasonable opportunity literature which she could not work without.

Today the entire botanical book collection numbers some 5000 volumes. It covers the field of color-plate magazines, the great color-plate books of the eighteenth and nineteenth centuries, the classic monographs, such as, Ruiz and Pavon, Humboldt, Salm-Reifferscheid-Dyck, Plumier, Rumphius, Lamarck, *Flora Braziliensis*, and the important regional floras of the world, with appropriate emphasis on those of western America. While the botanical library represents the accretion of many

purchases and gifts, the crowning gift of all is Miss Eastwood's own library, given by her on the day she retired, to remain as a perpetual monument for the benefit of those who follow after.

*Books are the most remarkable creation of man.
Nothing else he builds ever lasts.*

—CLARENCE DAY



The Botanical Collections of the California Academy of Sciences

BY JOHN THOMAS HOWELL

San Francisco

The present herbarium of the California Academy of Sciences dates not from the Academy's founding in April, 1853, but rather from the San Francisco earthquake and fire on April 18, 1906. On that fateful day, as Miss Eastwood and her helpers rescued the last bundle of specimens and turned their back on the old Academy building, already threatened by flames, the new herbarium of the new Academy was begun. The 1497 specimens in the wagon rattling over the cobblestoned streets towards Russian Hill was the herbarium *pro tempore*, and it is from that relatively small but important collection that the present herbarium of about 370,000 specimens has grown.

Those 1497 specimens were the choicest part of the old Academy herbarium, the types and isotypes and other critical specimens that had been segregated from the general herbarium by Miss Eastwood because she had felt they were deserving of special care and attention. From that auspicious beginning in April, 1906, the collection of types and isotypes of the Academy herbarium has grown until now it is more than twice as large and is maintained in special cases apart from the general herbarium. During the past decade, the type herbarium has been expertly curated by Dr. Thomas H. Kearney, under whose supervision a card catalogue of types of spermatophytes has been prepared. This catalogue is now being published in installments.* A published catalogue covering the cryptogamic types, which will list the important collections of algae and furnish a much-needed list of the types of Harkness fungi, is planned to follow the present phanerogamic series.

By good fortune, several taxonomic groups in the general herbarium were saved because they were on loan to specialists

*Plant types in the Herbarium of the California Academy of Sciences. The Wasmann Collector, vol. 7 (1949); Wasmann Journal of Biology, vol. 8 (1950), vol. 9 (1951), vol. 10 (1952), vol. 11 (1953).

at the time of the San Francisco disaster. Specimens of *Lupinus* were in Cambridge, Massachusetts, being studied by Prof. B. L. Robinson for his treatment in a part of Gray's Synoptical Flora that was never published. The collection of *Eschscholzia* was still in Washington, D.C., where it had served as the basis of Greene's revision of the genus in Pittonia, vol. 5. The third large loan then outstanding was a comprehensive collection of *Polemoniaceae* which, in the hands of the German botanist, August Brand, was perhaps the principal western American basis for his revision of that family in Das Pflanzenreich. The character of the material in these general collections that were saved furnishes some slight insight into the richness and diversity that must have characterized the old Academy herbarium that was consumed in the holocaust of that dread day of destruction.

Two other collections belonging to the Academy at the time of the earthquake and fire but, fortunately, not yet in the Academy museum, should be noted here: the 1905 collections of A. A. Heller and the invaluable collections of the Academy expedition to the Galápagos Islands. Through arrangement with Miss Eastwood and in consideration of financial assistance extended to him, Heller had agreed to deposit in the Academy herbarium the types and first set of specimens of his 1905 field trips, which were among the most profitable botanically that he ever made. Reference to these facts is made in the opening pages of *Muhlenbergia*, vol. 2, where it can be ascertained that some 35 types came to the Academy through the arrangement.

The expedition to the Galápagos Islands had spent one full year in the islands, from Sept. 23, 1905, to Sept. 25, 1906, making the most complete natural history studies that have ever been made in that famous archipelago. The treasure trove of scientific specimens from the expedition became destined to form one of the chief building blocks on which the new Academy museum was to arise and to regain world renown in scientific circles. The botanical collections of that expedition, together with those obtained in 1932 on the Templeton Crocker Expedition, make the Academy the world's chief source of information on the plant life of the Galápagos Islands.

Following the earthquake and fire, several herbaria owned by individuals were donated to the Academy and gave to the

present herbarium some of its most valued collections. Miss Eastwood has already recounted the importance of these herbaria in LEAFLETS OF WESTERN BOTANY, volume 5, pages 45 to 48, where she describes the collections of Evelina Cannon, William W. Carruth, George R. Kleeberger, and E. K. Abbott. More recent gifts have included the herbarium of Ella Dales Cantelow (also mentioned by Miss Eastwood in the article referred to) and the Hubby Herbarium. The latter was presented to the Academy by the Ojai Branch of the Ventura County Library, where it had been stored for many years and where it was discovered by Mr. Henry M. Pollard. The Hubby Herbarium is chiefly important because of the large number of specimens collected in the 1890's by Frank W. Hubby and Miss Nora Pettibone in the vicinity of Ojai, Ventura County, California. These collections are an important complement to the large and exhaustive collections Mr. Pollard made in the watershed of the Ventura River while a teacher at the Ojai School for Boys in the Ojai Valley. The first set of Mr. Pollard's collections are also deposited in the Academy herbarium, a gift from Mr. Pollard. It is hoped that the Hubby and Pollard collections will some day furnish the basis for a local flora of the Ojai region, where desert, coastal, montane, and cismontane phytogeographic factors bring together in a restricted area one of the most interesting plant assemblages in California.

Mr. Lewis S. Rose, over a period of more than twenty years, is the one who has given more specimens than anyone else to the Academy herbarium. An honorary member of the herbarium staff, he has devoted himself to the collection and distribution of western American plants, chiefly Californian. The first set of his plants has always been available to the Academy, where most of his material has been identified. His duplicates have been offered for exchange on all of the six continents, and the rich returns from this extensive activity have been deposited as a gift in the Academy herbarium under the stamped designation, "Collection of Lewis S. Rose." In 1942, when I dedicated in his honor *Senecio Lewisrosei*, I estimated that he had given to the Academy some 53,000 specimens. Now the number is more nearly 70,000, and I am certain it would be even larger if the facilities of the Academy herbarium were commensurate with the activity and ambition of our friend and benefactor!

H. D. Ripley and R. C. Barneby, now residents of New York (State) but formerly of England and of California, have, through their wide and diligent field labors in the western United States, and particularly in the Great Basin area, contributed more taxonomic and phytogeographic knowledge than most other contemporary workers. Since 1941, when the two began a systematic field study of arid parts of the American Southwest, they have deposited in the Academy herbarium the choicest parts of their collections, under the appropriate label-head, *Plantae Selectae Occidentales*. Very early in this field work, Mr. Barneby began his revolutionary studies on the North American species of the genus *Astragalus*, and one by-product of his intensive field and herbarium researches is the development of an outstanding collection of this genus in the Academy herbarium. The gifts of Ripley and Barneby to the herbarium total more than 4000 specimens, of which 50 represent types of taxa proposed by Mr. Barneby, while still other specimens are types or isotypes of taxa by other workers based on Ripley and Barneby specimens. The names of these brilliant and indefatigable collectors will be forever associated with the twentieth century botanical exploration of our Southwestern deserts in the names of such plants as *Eriogonum Ripleyi*, *Lesquerella Barnebyi*, *Gilia Ripleyi*, *Phacelia Barnebyana*, and *Castilleja Barnebyana*, and by the superb plant collections they have deposited in the Academy herbarium and elsewhere.

Another noteworthy collection from the Great Basin that has been given to the Academy is the Linsdale collection from the Toiyabe Mountains in central Nevada. The set numbered 1000 specimens and was prepared by Jean M. and Mary Ann Linsdale during the course of Dr. Linsdale's field work on the vertebrates of the Great Basin. The collection is one of the most complete ever made in the Toiyabe Mountains and was the basis of a report on the plants of the range (Wasmann Journal of Biology 10:129-200). The Great Basin collections of the Linsdales, of Ripley and Barneby, and of Eastwood and Howell, together with extensive Basin material received by exchange from the Utah State Agricultural College in Logan, give to the Academy an outstanding research collection pertaining to a large and interesting part of the western United States.

Over the years, two other botanists have been generous in

their donations to the Academy herbarium, Milo S. Baker and Robert F. Hoover, although with both, the first sets of their specimens are to be found elsewhere. It is Mr. Baker who first brought the Pitkin Marsh in Sonoma County to the attention of botanists generally and it is he who was foremost in the botanical rediscovery of Lake County. Mr. Baker has supplied the Academy with duplicates of most of his interesting discoveries, including many isotypes of new taxa based on his collections. Through Dr. Hoover's continued generosity, the Academy has received many isotypes and other valued specimens and has thus been able to keep abreast of the advance of floristic knowledge to which his many important and critical discoveries have contributed.

Now that I have begun as an Academy project a flora of the Sierra Nevada, the Academy collections from that range are assuming ever greater value as taxonomic and phytogeographic studies proceed. The first intensive collecting I did as a novice in botany was in the Sierra Nevada in the summers of 1923 to 1925; and, from 1940 to 1949, I was offered unsurpassed opportunities to collect in the higher parts of the range by the Sierra Club through its Base Camp outings under the leadership of Oliver Kehrlein. Since 1949, Peter Raven has carried on this work under the auspices of the Sierra Club and his collections are deposited in the Academy herbarium. For about twenty years, Clarence R. Quick has collected plant specimens as he has gone about the Sierra Nevada in connection with his work on the white pine blister rust control program, and the larger part of the first series of his well-prepared specimens has been given to the Academy. Many hundreds of Sierran specimens came to the Academy when Mark Kerr gave his herbarium, which was devoted chiefly to Inyo County. The Plumas and Sierra County collections of Ella Dales (Mrs. H. C.) Cantelow, of Anna Head, and of Dorothy (Mrs. E. C.) Sutcliffe are particularly valuable, while the collections of Henry M. Pollard from the regions around Huntington Lake and the Mammoth Lakes give the Academy reference material from those parts of the range. Among others whose Sierran collections (complete or partial) are a valued part of the Academy herbarium, the following should also be mentioned: Mrs. H. P. Bracelin, A. Eastwood, Roxanna S. Ferris, M. S. Jussel, David D. Keck, Hans

Leschke, Elsie Zeile (Mrs. W. R.) Lovegrove, Enid (Mrs. Charles E.) Michael, Anita Noldeke, F. W. Peirson, L. S. Rose, C. W. Sharsmith, and G. L. Stebbins, Jr.

The specimens of many other collectors have also been given to the Academy, sometimes as single large collections, but generally in small lots from time to time over the years. While it is not possible to discuss these collections in detail here, it is desirable to record the names of some of these collectors since their specimens have frequently furnished material on which new taxa have been based and have added many plants of value for systematic and phytogeographic studies. Among the collectors who should be noted here are: Drs. Fred and Charlotte Baker, Marian L. Campbell, T. D. A. Cockerell, Chester Dudley, W. I. Follett, G. Dallas Hanna, J. K. Henry, William F. Herrin, Junea W. (Mrs. G. Earle) Kelly, J. August Kusche, Gregory S. Lyon, E. P. Meincke, C. Hart Merriam, Frances Payne, Carl Purdy, G. P. Rixford, Lester Rowntree, Peter Rubtzoff, L. E. Smith, Dr. and Mrs. E. C. Van Dyke, E. R. Weston, and Ynez Whilton Winblad.

Of the nonvascular cryptograms, the Academy herbarium boasts only of its bryophyte collection and of the hundreds of specimens of algae and fungi in the type herbarium. The general collection of *Musci* numbers about 11,000 specimens and, though world-wide in compass, it is chiefly valuable for the California section, which was used to advantage by Dr. L. F. Koch in the preparation of his catalogue of California mosses (Leaflet West. Bot. 6:1-40). Since the completion of that work, Mrs. Fay A. MacFadden has presented the Academy with nearly a thousand selected specimens of *Musci*, filling many gaps in our California series.

Even more important than the Academy collection of *Musci* is our collection of *Hepaticae*. It numbers only about 4000 specimens but contains what is probably the largest collection of California hepatics in the world. The assembling and care of this important collection was the devoted task attended to over several decades by Mrs. Dorothy Sutcliffe, who donated to the Academy everything that went into her work. As in all groups, the Galápagean collections of bryophytes are outstanding. Through the Kleeberger Herbarium (noted above), the Academy acquired the Coe F. Austin distributions and, in the Prager

Herbarium (noted below), are some classical collections from Germany and elsewhere.

Some of the most important sections of the herbarium have been developed because of the special interest of members of the staff in certain groups of plants. Thus Miss Eastwood's interest in the lupines, manzanitas, and paintbrushes over many decades led to the accumulation of large series of critical specimens in the genera *Lupinus*, *Arctostaphylos*, and *Castilleja*, while the same can be said to have resulted from my interest in *Eriogonum*, *Phacelia*, and *Cirsium*. The largest single collection in the entire herbarium is probably that of North American *Carex*, which was developed through the critical and energetic interest of J. W. Stacey, who for a number of years was a Research Associate of the Academy. Mr. Stacey inspired me with his enthusiasm, and I am happy to state that now a keen and discerning interest is being shown in California's largest plant genus by still younger botanists, by Peter Rubtzoff in his work on the Sonoma County marshes, and by Peter Raven in his field work in Napa County and in the Sierra Nevada. For more than a decade, Dr. Hans Leschke has contributed to our understanding of the genus through his discriminating field work, but his gifts to the Academy herbarium are not restricted to *Carex* alone.

The most recent notable development of a special group in the herbarium is that of the New World *Malvaceae*, due to the critical studies of Dr. Thomas H. Kearney, who, since his retirement from a position in the U. S. Department of Agriculture, has been an honorary member of the herbarium staff. Under Dr. Kearney, the Academy's *Malvaceae* have tripled or quadrupled, and although an enviable collection of New World plants is being assembled, the vast development of the family in Latin America leaves much yet to be accomplished in that direction. When not working with *Malvaceae*, Dr. Kearney is busy with Arizona plants sent him for determination, and the Academy has him to thank chiefly for the large collections from that state which augment an already-outstanding regional representation that resulted from the field work of Miss Eastwood.

It is generally agreed that one of the most valuable parts of the Academy herbarium is its horticultural collection. These collections are distributed through the general herbarium, but

are set apart from specimens of non-cultivated plants by the orange genus-covers in which they are filed. It is not easy to estimate the size of the horticultural collection, but it probably exceeds 50,000 specimens. The largest part of this collection has been obtained from California gardens, parks, and nurseries, and more of these plants have been collected by Mr. Eric Walther, Supervisor of the Strybing Arboretum, than by anyone else, although Miss Eastwood collected a great number. Other important collections of California garden specimens have come from Miss Elizabeth McClintock and from Mrs. H. P. Bracelin. Extensive collections of horticultural material from outside California have come from the Arnold Arboretum and from the Royal Botanic Gardens at Kew, England. The Prager Herbarium, discussed below, also contains many specimens of plants cultivated in the botanic gardens of Germany. Sometimes these Prager specimens represent quite ordinary plants, but at other times, as in the case of *Polygonum argyrocoleon* Steudel ex Kunze which I discussed in this journal in 1934, the cultivated plant may be as important as the type-collection itself.

The Herbarium of Albert Prager of Leipzig, referred to in the preceding paragraph, was purchased by the Academy at the insistence of Miss Eastwood and through the generosity of seven Academy members. The size of the herbarium may never be known since there is no record of an actual count of specimens,—for instead of the number of specimens, Prager kept account only of the number of species, and these totaled almost 26,000. It seems safe to assume that the number of specimens would be at least double the total number of species in Prager's catalogue.

The outstanding riches of the Prager Herbarium have been described before (Proc. Calif. Acad. Sci., ser. 4, 11:625-627; Leaflet West. Bot. 6:205-207) and their importance in adding to the prestige and usefulness of the Academy herbarium cannot be overestimated. What of import might turn up in any particular group of plants can scarcely be foretold, so varied are the collections and so diverse the sources from which Prager obtained them. Who, for example, would have expected to find among the Prager grasses a part of the type-collection of *Anthochloa lepida* obtained by Meyen at 15,000 feet in the Peruvian

Andes, the collection from which Nees and Meyen described their species and on which they based their genus? Yet there it is in the Prager Herbarium, and, so far as I have been able to ascertain, it is a collection otherwise represented in America only by a fragment (ex herb. Berol.) in the Grass Herbarium of the U. S. National Herbarium.

Academy collections from the far north also constitute one of its outstanding sections, not so important as the Galápagean and western North American collections certainly, but notable nevertheless. Here we find first or original sets by Alice Eastwood, George Haley, Edward Johnston, Ynez Mexia, Malcolm Smith, Harry Swarth, and others from northwestern Canada, Alaska, and the Aleutian and Pribiloff islands, and those by Louise A. Boyd, George Haley, and H. J. Oosting from the eastern Canadian Arctic, Greenland, and Europe. From Eyerdam, Hultén, G. N. Jones, H. L. Mason, M. P. Porsild, and many others have been obtained extensive collections by exchange or by purchase. And again in the Prager Herbarium there is a wealth of northern European collections, with a generous sprinkling of Greenland plants by J. Vahl and not a few fragments from classic collections made by Russian collectors in Alaska.

Collections resulting directly from the field work of the curators account for about one-fifth of the entire herbarium. Miss Eastwood and I, individually and jointly, have collected approximately 60,000 numbered specimens of vascular plants. When I joined the staff in June, 1930, I brought with me my herbarium of about 8000 specimens which I gave to the Academy; and, in 1949, on joining the curatorial ranks of the Department of Botany, Miss Elizabeth McClintock presented her personal collections, particularly rich in plants cultivated in southern California and in material of *Hydrangea*. Miss Betty Hammerly, while a member of the department, accompanied an entomological expedition under the direction of A. E. Michelbacher and E. S. Ross to the Cape region of Lower California and obtained many desirable specimens.

The expeditions of the Academy have brought into the herbarium some of its most valuable collections. Although a number of expeditions have been sponsored by the Academy, the most important from a botanist's viewpoint have been: the

expedition to the Galápagos Islands in 1905-06, Alban Stewart, botanist; the expedition to the Gulf of California in 1921, Ivan Johnston, botanist; the expedition to the Revillagigedo Islands in 1925, Herbert L. Mason, botanist; the Templeton Crocker Expedition in 1932, J. T. Howell, botanist. Among the chief contributions made by the Academy to systematic botany and phytogeography are the assembling of the plant materials of these expeditions and the publishing of reports on the expeditions and collections.

Belonging to the Department of Botany are numerous objects of both scientific and popular interest, mostly valuable for museum exhibition purposes. The Dennison, Fauntleroy, and Vosburg collections of water color paintings of California wild flowers and the Pollard carvings from the woods of California plants, particularly from manzanita burls, may be noted in this regard.

Also to be included as a unique museum object is the herbarium of Anders Beckman that was completed in 1752. Made up like a scrap-book and containing specimens of several hundred pressed Swedish plants, this old collection was presented to the Department of Botany by Mrs. H. P. Bracelin to whom it had been given by Sara Beckman Eichorn, a direct descendant of the man who had prepared the specimens so long ago and so far away. Dr. Carl Skotsberg, on examining this botanical heirloom, remarked that Anders Beckman was probably a German who went to Sweden to study under Linnaeus. The Beckman Herbarium is perhaps one of the oldest plant collections in America.

One more botanical collection of the Academy must be noted, although it is not in the Department of Botany: the very important collection of diatoms which is in the Department of Paleontology. The basis of the collection is the material of William H. Norris, one of the founders of the San Francisco Microscopical Society, but other collections are included, notably the numerous specimens that have been prepared or acquired by Dr. G. Dallas Hanna in connection with his geological work. There are several thousand slide preparations in the diatom herbarium, of which 600 slides (including 200 holotypes) are segregated in the type collections of the department. In connection with his research in this field, Dr. Hanna has gathered together an outstanding library on diatoms which includes the

important pamphlet collection of Pantocsek, well-known Hungarian diatomist.

And so in large part, the botanical collections of the California Academy of Sciences stand before the scientific world after one hundred years. Repeatedly Miss Eastwood has asserted that the present herbarium is much better and much more useful than the one that was lost in 1906; but she always adds her regrets at the irreparable loss of Philippi's collections from Chile, of Hillebrand's from Hawaii, and her own from Colorado and Utah, to mention only three.

The growth of the present herbarium has been impressive,—from a few hundred specimens in 1906 to over 370,000 in 1953. But knowledge (*scientia*), not size, is the end for which we strive. Unless an herbarium serves as a basis for study and for published research, it is little more than a well-ordered hay-stack. In its first hundred years, the Academy herbarium has met and answered the challenge of the science it serves. In 1953, it enters upon its second hundred years with the expectation and hope that its scientific usefulness will be augmented and ever more fully realized.

With Ulysses' gray spirit we must ever yearn

*To follow knowledge like a sinking star
Beyond the utmost bound of human thought.*



Appendix 1: Notes on the Plates

Plate 1. Looking southward over the museum buildings of the California Academy of Sciences in Golden Gate Park, San Francisco, in 1953. The Department of Botany occupies the western half of the second floor of the wing on the extreme right. The proposed Alice Eastwood Hall of Botany will be erected in the court immediately to the left of this wing according to current plans. The Strybing Arboretum lies a short distance to the west of the Academy buildings beyond the right edge of the picture.

Plate 2. The First Congregational Church of San Francisco on the southwestern corner of Dupont Street (the present Grant Avenue) and California Street. After the church moved to newer quarters, the California Academy of Sciences occupied this building from 1874 to 1891. Our picture, from the files of the Society of California Pioneers, is a detail from an old pictorial entitled the "San Francisco Rose," Frederick Hess, San Francisco, publisher. Petal fragments of the "rose" show in the lower part of the reproduction.

Plate 3. The façade of the Academy's combined office and museum building on the south side of Market Street between Fourth and Fifth streets in 1893. This imposing building, which was erected on land deeded to the California Academy of Sciences by James Lick and built with money from his estate, was occupied by the Academy from 1891 until it was destroyed by the San Francisco Earthquake and Fire in 1906. Stores and offices fronted on Market Street, while the natural history exhibits and research departments occupied the museum quarters which adjoined to the rear. The California Academy of Sciences, a tax-free California corporation, still derives its chief income from the James Lick bequest.

Plate 4. View of the court, the glass roof, and the sixth floor gallery in the Academy's museum building on Market Street. According to Joseph R. Slevin, the doors on the right led to the rooms of the Botany Department and he recounts that Miss Eastwood used the iron railing along the balcony for drying

plant blotters. The Department of Entomology occupied the sixth floor rooms on the left, while the offices of the Academy, the library, and other research departments were on the two galleries below. The ground floor and the two lowest galleries were devoted to the public museum.

Plate 5. Albert Kellogg's original water color drawing of his species, *Viola purpurea*, which, together with a specimen, was exhibited at the meeting of the California Academy of Sciences on May 28, 1855. This drawing and an herbarium specimen constitute the type of the species which was described in the Proceedings of the Academy (1: 56,—1855), and they were among the specimens saved by Miss Eastwood from the 1906 fire. Beneath the drawing in Kellogg's script we read "Viola purpurea Kellogg from a spm. [specimen] of Placerville." In the original description the type-locality was given vaguely as "from the interior" of California. This picture, which is not only of importance as an aid in the proper interpretation of Kellogg's species but also as an excellent example of the "primitive" style that distinguished his botanical art, has not before been published.

Plate 6. Alice Eastwood at her desk in the Botany Department on July 19, 1948. Six months later, on her ninetieth birthday, January 19, 1949, Miss Eastwood retired as curator of the department, the position she first assumed in December, 1892.

Plate 7. The dedication monument in the Strybing Arboretum and Botanical Gardens, of which Mr. Eric Walther is Supervisor. These gardens are in Golden Gate Park adjacent to the buildings of the California Academy of Sciences and furnish the Botany Department of the Academy with the botanical garden complement that is so desirable for a well-rounded botanical institution. The Strybing monument was formerly a part of the Donahue Monument at the intersection of Market and Bush streets and was procured for the Strybing Arboretum by Mr. Walther when that famous landmark had to be shifted to make way for a modern traffic arterial.

Plate 8, fig. 1. Templeton Crocker's yacht *Zaca* at anchor in Academy Bay, Indefatigable Island in the Galápagos. Mt. Crocker, the highest point on the island, is seen on the skyline near the right edge of the picture. The first natural history specimens from the summit of the mountain were obtained in May, 1932, by the Academy party, which, headed by Mr. Crocker, made the first ascent.

Plate 8, fig. 2. An Eastwood and Howell expedition in the field: Monument Valley on the Arizona-Utah line, September 14, 1938. For nine years, from 1933 to 1941, numerous field trips by automobile were made jointly by Alice Eastwood and J. T. Howell in California and other western states. More than 10,000 botanical specimens and innumerable duplicates were collected on these outings, which ranged from short excursions around San Francisco to long expeditions across mountains and deserts. The reports on these trips were, for many years, one of the chief burdens of LEAFLETS OF WESTERN BOTANY, while the plants discovered were yet another contribution to the Academy's Department of Botany.



Appendix 2:

List of Persons Mentioned in Text

- Abbott, E. K., 91.
 Austin, C. F., 94.
 Babcock, E. B., 76.
 Bailey, L. H., 72.
 Baker, F. and C., 94.
 Baker, M. S., 93.
 Barkelew, F. E., 73.
 Barneby, R. C., 76, 92.
 Bartlett, W. C., 56.
 Bartram, E. B., 75.
 Bates, H., 69.
 Beckman, A., 98.
 Behr, H. H., 46, 50, 55, 70-72.
 Benson, L. A., 76.
 Bigelow, J. M., 48.
 Bloomer, H. G., 47, 69.
 Bolander, H. N., 50, 51, 69, 70, 72.
 Bonar, L., 75.
 Bowman, M. C., 57.
 Boyd, L. A., 97.
 Bracelin, Mrs. H. P., 94, 96, 98.
 Brand, A., 90.
 Brandegee, Mr. and Mrs., 85.
 Brandegee, Mrs. M. K. L. C., 55, 58, 59.
 Brandegee, Mrs., see also Mrs. Curran.
 Brandegee, T. S., 53, 55, 58, 59, 71, 72, 74.
 Brewer, W. H., 45, 49.
 Bryant, W. E., 56, 74.
 Burbank, L., 66.
 Byxbee, E. S., 73.
 Campbell, D. H., 72, 73, 76.
 Campbell, Mrs. M. L., 94.
 Cannon, E., 57, 91.
 Cannon, W. A., 73.
 Cantelow, E. D. (Mrs. H. C.), 57, 91.
 Carruth, W. W., 91.
 Clark, L., 75.
 Clayton, J., 69.
 Cleveland, D., 56.
 Cockerell, T. D. A., 94.
 Cogniaux, A., 73.
 Cooke, M. C., 71.
 Cooper, J. G., 49.
 Crocker, T., 101.
 Curran, M. K., 54, 71, 72.
 Darbshire, O. V., 75.
 Davidson, G., 44, 48, 55.
 Derby, G. H., 49.
 Drury, A., 64.
 Dudley, C., 94.
 Dudley, W. R., 73.
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 Ellis, J. B., 72.
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 Ewan, J., 76.
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 Farris, C., 44.
 Ferris, Mrs. R. S., 94.
 Follett, W. L., 94.
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 Gibbes, C. D., 69.
 Gibbons, H., 44.
 Gibbons, W. P., 45, 50.
 Goodridge, J., 46.
 Goodspeed, T. H., 76.
 Gray, A., 51, 71.
 Greene, E. L., 45, 53, 71, 72, 90.
 Grinnell, J., 76.
 Gunnison, Capt., 50.
 Haines, C., 56.
 Haley, G., 97.
 Hall, H. M., 76.
 Hammerly, B., 97.
 Hanna, G. D., 75, 94, 98.
 Harford, W. G. W., 44, 48, 54, 55.
 Harkness, H. W., 71-73.
 Harte, B., 52.
 Hasse, H. E., 56.
 Head, A., 93.
 Heermann, A. L., 48.
 Heller, A. A., 90.
 Henry, J. K., 94.
 Herrin, W. F., 86, 94.
 Hitchcock, A. S., 75.
 Hoover, R. F., 93.
 Howe, M. A., 75.
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 Hubby, F. W., 91.
 Hultén, E., 97.
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 Hunt, C. L., 57.
 Huntington, C. P., 52.

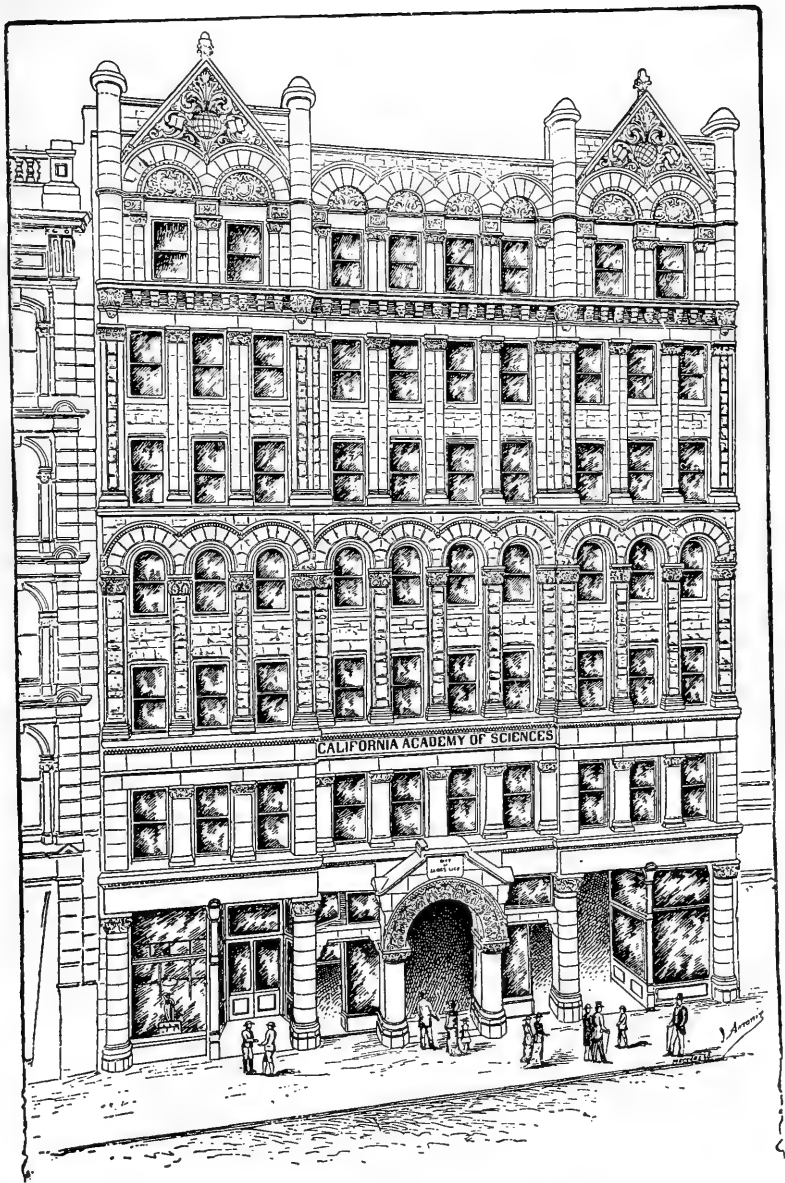
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 Johnston, E., 97.
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 Kearney, T. H., 78, 89, 95.
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 Kincaid, M. W., 56.
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 Putnam, S. O., 50.
 Quick, C. R., 93.
 Randall, A., 43, 69.
 Raven, P., 78, 93, 95.
 Ripley, H. D., 92.
 Rixford, E., 86.
 Rixford, G. P., 56, 94.
 Robinson, B. L., 90.
 Rose, L. S., 78, 91, 94.
 Ross, E. S., 97.
 Rowntree, L., 94.
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 St. John, H., 76.
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 Vahl, J., 97.
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 Winblad, Y. W., 94.
 Wolf, C. B., 63, 76.
 Wolle, F., 72.
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 Wright, C., 46.



Plate 1. The museum buildings of the California Academy of Sciences in Golden Gate Park, San Francisco, in 1953.
Aerial photograph by Clyde Sunderland.

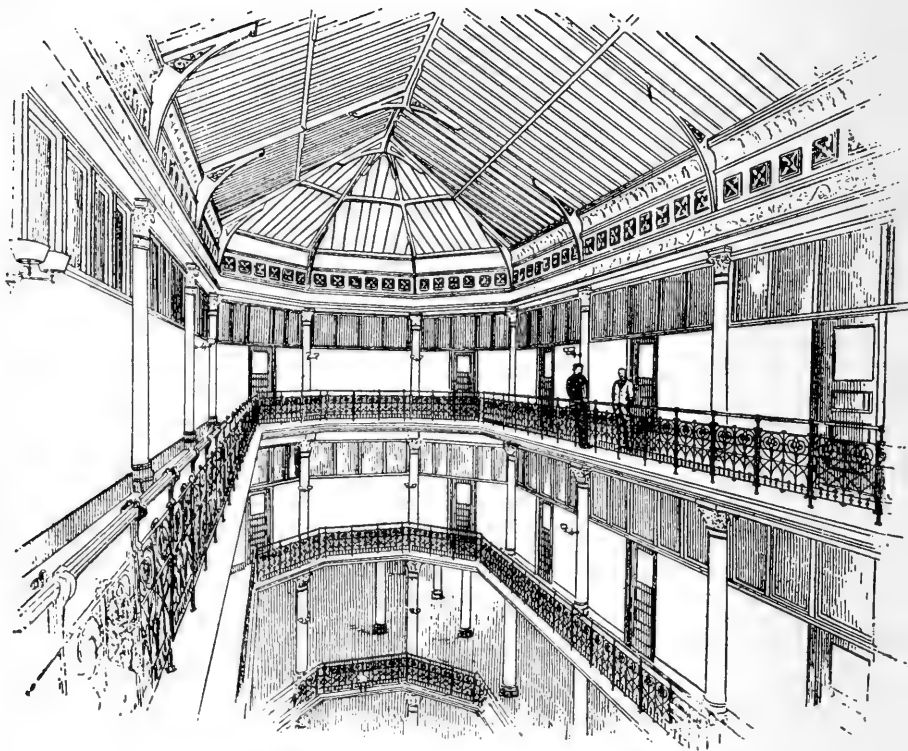


Plate 2. The old First Congregational Church building which housed the Academy from 1874 to 1891 after the church had moved to a newer edifice.
Contemporary print, from the files of the Society of California Pioneers.



The California Academy of Sciences, San Francisco.

Plate 3. The Academy's combined office and museum building on Market Street, the princely bequest of James Lick.
From the California Illustrated Magazine, January, 1893.



Upper Floor, devoted to Library, Curator's Rooms, etc., showing Court.

Plate 4. The sixth floor gallery of the Academy's Market Street museum; the doors on the right open into the Department of Botany.
From the California Illustrated Magazine, January, 1893.



Viola purpurea Kellogg
from a photo of the original

Plate 5. *Viola purpurea*: Albert Kellogg's 1855 water color of his new species,
"of Placerville."
From a photograph of the original in the Academy's Department of Botany.

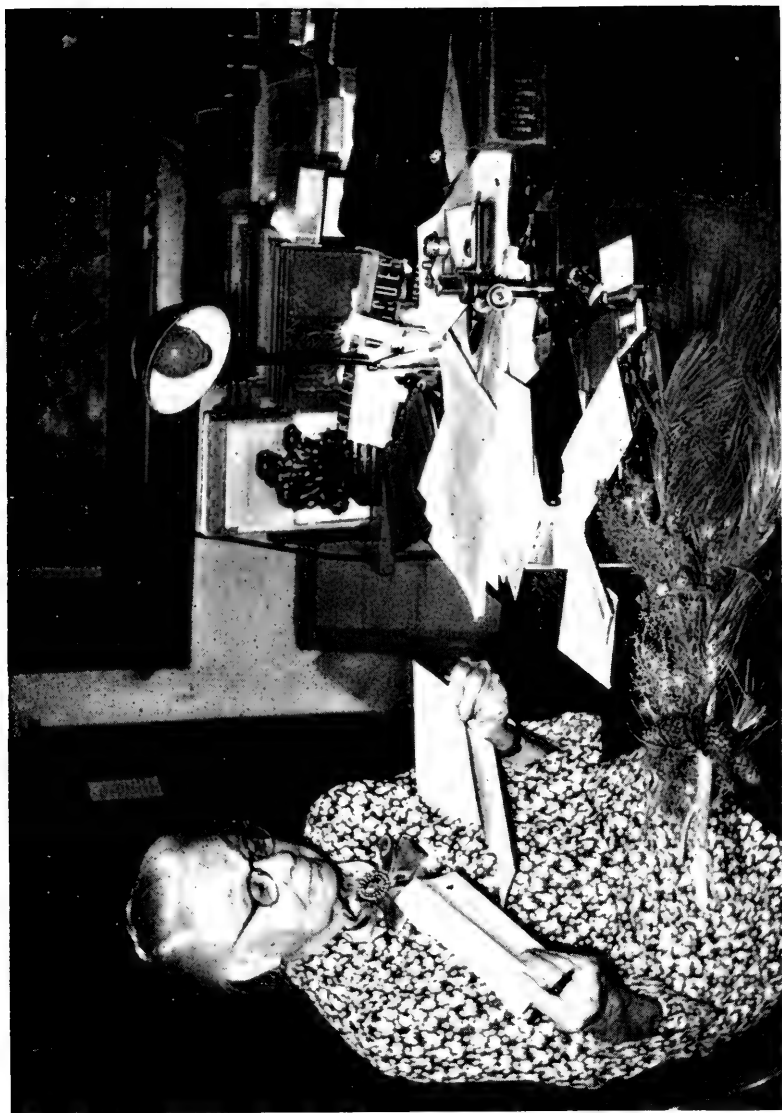



Plate 6. Alice Eastwood at her desk on July 19, 1918.
Photograph by Irving D. Hicok, Sacramento.



THE STRYBING ARBORETUM AND BOTANICAL
GARDENS ARE A LIVING MEMORIAL TO
CHRISTIAN AND HELENE STRYBING WHOSE
PUBLIC-SPIRITED GENEROSITY MADE
POSSIBLE THE CREATION OF THESE GARDENS

Plate 7. The dedication monument in the Strybing Arboretum and Botanical Gardens of Golden Gate Park.
Photograph by Toshio Asaeda.



Plate 8, fig. 1. Templeton Crocker's yacht *Zaca* in Academy Bay, Galápagos Islands, May, 1932.

Photograph by Toshio Asaeda.

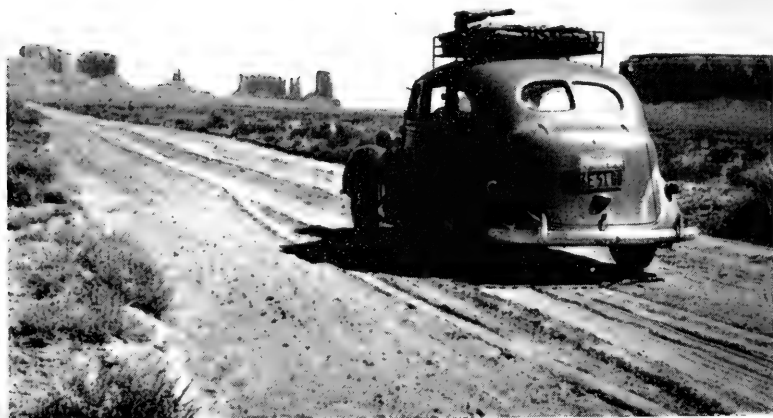


Plate 8, fig. 2. An Eastwood and Howell expedition in the field: Monument Valley on the Arizona-Utah line, September 14, 1938.

Photograph by J. T. Howell.

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LEAFLETS
of
 WESTERN BOTANY

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DECEMBER 3, 1953

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NOTES ON THE FLORA OF OREGON

BY WILLIAM H. BAKER

University of Idaho, Moscow

Since the last report on plant records for Oregon(2), the following represent the author's collections which are either new to the state or are extensions in range of sufficient interest to warrant further discussion. All of the specimens are deposited in the Herbarium of the University of Idaho or remain in the personal herbarium of the author. Duplicates have been distributed as indicated. For assistance in making determinations, appreciation is expressed to the following specialists: Dr. Lincoln Constance, Dr. Arthur Cronquist, Dr. F. J. Hermann, Mr. John Thomas Howell, Prof. Morton E. Peck, and Mr. J. R. Swallen.

AGROSTIS VARIABILIS Rydb. Dry hillside, north of headquarters, Crater Lake National Park, Cascade Mountains (6476 feet), Klamath County, No. 6413 (US). Duplicate identified by J. R. Swallen. This plant has a wide distribution along rocky creek banks and on mountain slopes from British Columbia to California and eastward through Idaho, Nevada, Utah, and Colorado. It has been apparently confused with *A. Rossae* Vasey in the floras covering our area.

CYPERUS ERAGROSTIS Lamk. Roadside ditch at Cherry Flat (W. A. Cochran place), 4 miles north of Agness, Curry County, No. 4614; along the shores of the Rogue River at Cherry Flat, same locality, No. 4679. To our knowledge this is the first record of the plant from Curry County. John Thomas Howell(5) lists it from Marin County, California. This is a widespread species extending from California southward as far as western South America. It is of local distribution in our area and may be introduced.

CAREX INOPS Mkze. Dry open woods, Sand Ridge, along Lake Mountain Trail, Oregon Caves National Monument, Siskiyou Mountains, Josephine County, *Baker & Ruhle* No. 885 (CAS). The presence of this plant in the Siskiyou Mountains of Oregon is noted here because its chief distribution is in the Cascade Mountains and eastward. It has been reported as far south as the Siskiyou Mountains of California.

JUNCUS MARGINATUS Rostk. Wet ground edge of Fern Ridge Reservoir, No. 2415; roadside near Fern Ridge Reservoir, about 8 miles west of Eugene, Lane County, No. 2385. F. J. Hermann

(personal correspondence) regards this station for *J. marginatus* in Oregon as quite a novelty, as it is so far northwest of any other record of this species. The westernmost previously known limit for it has been from Nebraska and Kansas to Texas. He suggests that presumably it may have been accidentally introduced at Fern Ridge.

JUNCUS XIPHIODES E. Mey. Along the edge of Willamette Highway, summit of Pengra Pass (5281 feet), Cascade Mountains, Klamath County, *No. 2358*; moist banks at Vidae Falls, Crater Lake National Park, Cascade Mountains, Klamath County, *No. 7107*. Duplicate identified by F. J. Hermann. Peck(6) records this plant as occurring along the lower Umatilla River in northeastern Oregon and southward to Arizona and Lower California. Our two collections are intermediate stations for the plant in the Cascade Mountains which help to indicate its distribution. It is found but sparingly in Oregon.

ALLIUM ANCEPS Kell. Dry situations 10 miles southeast of Princeton, Harney County, *No. 1672*. This plant has been previously collected by Peck(7) in Malheur County and by Leach in Lake County. Our record for Harney County completes its occurrence in southeastern Oregon counties and fills in the gap in distribution of a species which has only been collected a few times in Oregon. It had long been considered to be limited to the eastern base of the Sierra Nevada.

CLEOMELLA HILLMANI A. Nels. Clay hillside above Trout Creek, Trout Creek Mountains, southeastern Harney County, *No. 1745*. Peck(7) has collected this species in the Sucker Creek country and about Adrian and Rome in Malheur County. Our record is believed to be the first for Harney County. It increases the Oregon range of this rare species considerably. The distribution, as hitherto known, was limited to northwestern Nevada. The type was obtained at Reno, Nevada.

CERCOCARPUS LEDIFOLIUS Nutt. Dry, rocky summit of Sugarloaf Peak, Siskiyou Mountains, Josephine County, *Baker & Ruhle No. 848*. Benson(3) lists this species from Steve Peak and the author has noted it on Whiskey Peak in the same general vicinity. Although it occurs widely in the Rocky Mountains and as far northwest as southeastern Washington, the species seems to be of very local distribution in the Cascade and Siskiyou mountains of Oregon.

POTENTILLA FRUTICOSA L. Moist grassy meadow on the north

side of Grayback Mountain, Siskiyou Mountains, Josephine County, *Baker & Ruhle No. 923*. A fairly common species in the Blue Mountains and in eastern Oregon. Apparently the first record for the Siskiyou Mountains of Oregon. Benson(3) reports its occurrence in the Siskiyou Mountains of California and states that it will probably be found in southwestern Oregon. Of wide distribution from Alaska to Labrador south to California, New Mexico, and New Jersey. It also occurs in Europe and Asia. Oftentimes it is an indicator of overgrazing on some range lands of the western United States.

ASTRAGALUS MALACUS T. & G. Dry sandy soil, along roadside, 5 miles north of Andrews, Harney County, *No. 1719*. This species has been collected once before in Oregon, also from Harney County. It should be looked for in other southeastern counties, when a thorough investigation of these areas is undertaken. It occurs as well in Idaho, Nevada, and California.

TRIFOLIUM ERIOCEPHALUM Nutt. var. *PIPERI* Martin. Edge of woods, Blue Mountains, about 22 miles north of Enterprise, Wallowa County, *No. 6046*; moist open meadow at Flora Junction, Blue Mountains, Wallowa County, *No. 6760*; moist meadow, near Sled Creek Ranger Station, Blue Mountains, about 20 miles north of Enterprise, Wallowa County, *No. 6771* and *7672*; moist meadow along a stream about 28 miles north of Enterprise, Wallowa County, *No. 7668*. During the past several years the writer has collected a nice series of this variety in the Blue Mountains of Oregon and adjacent Washington. It is also known from Idaho County, Idaho.

LOMATIUM NELSONIANUM Macbr. Dry hillside along the Rogue River, Rogue River Canyon, 5 miles east of Illahe, Curry County, *No. 3610* (WSC, UC, CAS). Lincoln Constance (personal correspondence) regards this as the only good collection of the plant he has ever seen; the type is a mixture of this and *L. dissectum*. It is certainly the least-collected species in the genus.

Asclepias cryptoceras Wats. var. *Davisii* (Woods.) W. H. Baker, comb. nov. *Asclepias Davisii* Woods., Ann. Mo. Bot. Gard. 26:261(1939). Dry sandy slope in the canyon of the Imnaha River, at Imnaha, Wallowa County, *No. 9038*. This collection has well-developed fruits. Reported previously by Peck(7) from Malheur and Baker counties. Woodson(8) records it from Grant County. Our station in Wallowa County completes its extension northward in Oregon. Its general distribution includes

eastern Oregon and southwestern Idaho. *Asclepias Davisii* was considered by Dr. R. E. Woodson to differ from *A. cryptoceras* in having larger flowers and corona-hoods more abruptly apiculate and somewhat shorter than the anthers (while in the latter they are considerably longer). Upon examination there seems to be some variation in the length of the corona-hoods and size of flower from specimen to specimen. All the material from Oregon has the abruptly apiculate corona-hoods. Since the similarities in appearance and distribution indicate a close relationship of the two entities, it is thought best to consider them as parts of a single species.

PHACELIA CORYMBOSA Jepson. Open rocky slopes, along the Big Tree Trail, Oregon Caves National Monument, Siskiyou Mountains, Josephine County, *Baker & Ruhle No. 201*; open dry hillside along the Marial-Illahe trail, Rogue River Canyon, at Clay Hill on Rogue River, Curry County, *No. 3878* and *4390*; dry open hillside, south slope of Iron Mountain, Curry County, *No. 5645*. The last is the most northern locality record the author has seen to date, being several miles north of the Rogue River. The plant is restricted to the Klamath-Siskiyou region of southwestern Oregon and northern California and, according to J. T. Howell (personal communication), to the northern Sierra Nevada of California.

PHACELIA FRIGIDA Greene. Dry pumice slopes, near summit of Lao Rock (8100 feet), *No. 6255*; dry pumice slopes, inside the rim near the summit of the Devil's Backbone, *No. 6238*; Cloud Cap, *No. 2568*, Crater Lake National Park, Cascade Mountains, Klamath County. Ranges from Crater Lake in the Cascade Mountains southward to the southern Sierra Nevada.

PHACELIA MUTABILIS Greene. Edge of open woods, Munson Meadow below headquarters, Crater Lake National Park, Cascade Mountains, Klamath County, *No. 6155* (UC, UW, CAS, WSC, NY). Duplicate identified by Lincoln Constance. Additional collections have been made in the same locality at Vidae Falls, *No. 2532*, and along the trail down to Crater Lake, *No. 1973*. It has a distribution from Mount Rainier to California. Apparently previous collections of the plant in Oregon have often been confused with other species of *Phacelia*.

CASTILLEJA PAYNEAE Eastw. Dry pumice soil, edge of Munson Meadow below headquarters, Crater Lake National Park, Cascade mountains, Klamath County, *No. 6143* (NY, UW, CAS,

WSC, UC). One of the commonest species in the park, abundant on all dry pumice slopes. It is found from the Three Sisters area in Oregon southward to Mount Lassen in California.

CENTAUREA PRATENSIS Thuill. Common along the roadside to Oregon Caves National Monument just east of Cave Junction, Josephine County, No. 6119 (NY, CAS, WSC, UC). Identified by J. T. Howell who notes that this plant is a derivative of the complex resulting from the hybridization of *C. Jacea* L. and *C. nigra* L. It was first known in western Europe but is now rather widespread in the United States and southern Canada.

ACHILLEA MILLEFOLIUM L. var *ALPICOLA* (Rydb.) Garrett. Dry inner slopes of the caldera at Cloud Cap (8000 feet), Crater Lake National Park, Cascade Mountains, No. 6291. A depauperate variety 1 to 4 dm. tall with margins of the involucre bracts dark brown to blackish. Found only on dry pumice slopes in this area. Of local distribution from moderate to high elevations in the mountains.

ARNICA NEVADENSIS Gray. West slope of Hillman Peak (8000 feet), No. 6401; Wizard Island, along rim of the crater, No. 6387; Garfield Peak, growing under *Tsuga Mertensiana* near the summit (8000 feet), No. 6184. All of the above numbers were obtained at Crater Lake National Park, Cascade Mountains, Klamath County. Another collection of this plant was made at the summit of Bohemia Mountain, Calapooya Range, Lane County (5967 feet), No. 5573. Identified by Arthur Cronquist. This species apparently ranges from the Olympics and Cascades of Washington to the Sierra Nevada of California and Nevada. In California, it is recorded by Jepson(4) as montane, 5000 to 7600 feet, from Inyo and Mariposa counties to Modoc County. Our collection from the Calapooya Mountains, southeastern Lane County, western Oregon, is an outlying colony which extends its known range.

ARNICA SPATHULATA Greene. East slope of Iron Mountain near the summit, Rogue River Mountains, southeastern corner of Coos County, No. 3185. Identified by Arthur Cronquist. Our station in Coos County appears to be the most northern record collected to date.

ANTENNARIA UMBRINELLA Rydb. Reflection Point, No. 2556; Munson Meadow below headquarters, Crater Lake National Park, Cascade Mountains, Klamath County, No. 6142. Resembles *A. alpina* var. *media* from which it differs by having blunter

involucral bracts and the base of the plants often more woody. It is often associated with the latter in the park. Local at high elevations in the Cascades and widely distributed in western mountains. Its occurrence in Oregon is not mentioned in any of the works dealing with the flora of the state.

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HASSEANTHUS, A SUBGENUS OF DUDLEYA

BY REID MORAN

A cytotaxonomic study* has shown that *Dudleya* and *Hasseanthus* are closely related. *Hasseanthus* is now transferred to *Dudleya*, as follows:

Dudleya subgenus **Hasseanthus** (Rose) Moran, stat. nov.

Hasseanthus Rose in Britton & Rose, Bull. N. Y. Bot. Gard. 3:37 (1903).

Dudleya Blochmaniae (Eastwood) Moran, comb. nov.

Sedum Blochmaniae Eastwood, Proc. Calif. Acad. II, 6:422 (1896).

Dudleya Blochmaniae subsp. **brevifolia** Moran, comb. nov.

Hasseanthus Blochmaniae subsp. *brevifolius* Moran, Desert Pl. Life 22:80 (1950).

Dudleya Blochmaniae subsp. **insularis** Moran, comb. nov.

Hasseanthus Blochmaniae subsp. *insularis* Moran, Desert Pl. Life 22:78 (1950).

Dudleya multicaulis (Rose) Moran, comb. nov.

Hasseanthus multicaulis Rose in Britton & Rose, Bull. N. Y. Bot. Gard. 3:38 (1903); *H. elongatus* Rose but not *Dudleya elongata* Rose.

Dudleya nesiotica Moran, comb. nov.

Hasseanthus nesioticus Moran, Desert Pl. Life 22:99 (1951).

Dudleya variegata (Watson) Moran, comb. nov.

Sedum variegatum Watson, Proc. Amer. Acad. 11:137 (1876).

*Charles H. Uhl and Reid Moran. The Cytotaxonomy of *Dudleya* and *Hasseanthus*. Amer. Jour. Bot. 40:492-502 (1953).

A NEW CEANOOTHUS FROM SAN LUIS OBISPO
COUNTY, CALIFORNIA

BY ROBERT F. HOOVER

California State Polytechnic College, San Luis Obispo

Ceanothus maritimus Hoover, spec. nov. Frutex prostratus late tegeticulatus caulibus ramosis rigidis crassis usque ad 1 m. longis; foliis oppositis, stipulis parvis suberosis, petiolis 1–2 mm. longis, laminis anguste vel late oblongis vel obovatis interdum latioribus quam longioribus, 8–20 mm. longis, 5–17 mm. latis, glabris nitentibus atrovirentibus supra, subter albo-tomentosis, margine perrevolutis integris vel 1–3 dentibus utrinque praeditis, apice mucronatis truncatis emarginatis obcordatisve; floribus pallide vel valde caeruleis; capsula appendicibus 3 erectis brevibus ornata.

Stems rigid, stout, prostrate, branching, up to 1 meter long, forming extensive mats; leaves opposite; stipules small, of corky texture; petioles 1–2 mm. long; blades varying from narrowly to broadly obovate or oblong or even broader than long, mucronate, truncate, emarginate, or obcordate at apex, 8–20 mm. long, 5–17 mm. wide, dark glossy green and glabrous above, white-tomentose beneath (often darkened by a mold), the margins distinctly revolute, with one to three teeth on each side or entire; flowers light to deep blue; capsule with 3 short erect appendages ("horns").

Originals of all collections except the last following are in the herbarium of California State Polytechnic College, San Luis Obispo, California. All localities mentioned are in San Luis Obispo County, California: 1.8 miles north of Arroyo de la Cruz on State Highway No. 1, January 24, 1948, *Hoover 7411* (type, in flower), April 14, 1948, *7448* (in fruit), May 16, 1948, *7529* (in flower); mouth of Arroyo de la Cruz (just south of, on hilltop), January 15, 1950, *Hoover 7759* (in flower), March 5, 1950, *7767* (in flower); San Simeon, *K. Brandegee in 1889* (University of California Herbarium). Recent search in the immediate vicinity of San Simeon has failed to disclose this species. Mrs. Brandegee may have made her collection from one of the two presently known colonies and given the nearest town as the locality — a common practice of the nineteenth-century (and of some contemporary) collectors.

At the first locality cited above, the plants grew on an ocean bluff with no other *Ceanothus* adjacent except typical *C. thyrsiflorus* Esch. At the second locality a remarkable association of low-growing shrubs was present, including another prostrate *Ceanothus* apparently referable to *C. dentatus* T. & G., a strictly prostrate form of *Arctostaphylos Hookeri* Don, and low mound-like clumps of a manzanita which resembles the description of *Arctostaphylos Andersonii* Gray var. *pajaroensis* Adams.¹

1. Published by McMinn, *Illustrated Manual of California Shrubs*, p. 418.

The Brandegee collection was described by McMinn (*Ceanothus*, p. 232) is minor variation 1 of *Ceanothus crassifolius* Torr. The specimen lacks flowers and is accompanied by no notes as to flower color or manner of growth. The prostrate stems and blue flowers which are now found to characterize *C. maritimus* seem adequate to separate it from all forms of *C. crassifolius*. The leaves of *C. maritimus* are quite variable, even on the same branch, but are prevailingly smaller than those of *C. crassifolius* (as noted by McMinn in the reference cited), as well as being more often entire and frequently broader in proportion to length.

Merely as a speculation, it may be suggested that *C. maritimus* originated as a hybrid between *C. crassifolius* and some blue-flowered species of northern origin (such, for example, as *C. gloriosus* J. T. Howell). Credibility is given to this suggestion by the occurrence close by of *Baeria macrantha* Gray, a species otherwise unknown south of Marin County, and by the fact that at least two other plants of northern distribution, *Calochortus uniflorus* H. & A. and *Godetia amoena* (Lehm.) Lilja, reach their southern limit in the same vicinity. Consideration of the numerous species reaching their southern limit elsewhere in northwestern San Luis Obispo County would make the relationship of *C. maritimus* to some northern form seem even more probable. Genetic experiments on this group of species should be undertaken by those having facilities for such work. In the meantime, it is clear that *C. maritimus*, whatever its origin, is well stabilized genetically. No other form of the subgenus *Cerastes* occurs near it, and there is no indication of hybridization now taking place. *Ceanothus maritimus* may therefore be a relic persisting from a time when the two species suggested above as parents ranged more widely along the coast and even possibly grew together, though now they are separated by more than three hundred miles.

This species should be a desirable one in cultivation where a prostrate blue-flowered shrub is desired. Probably it will thrive in warmer climates than will other species of similar appearance. Shrubs transplanted to San Luis Obispo, where high temperatures are much more frequent than in its native habitat, have done well.

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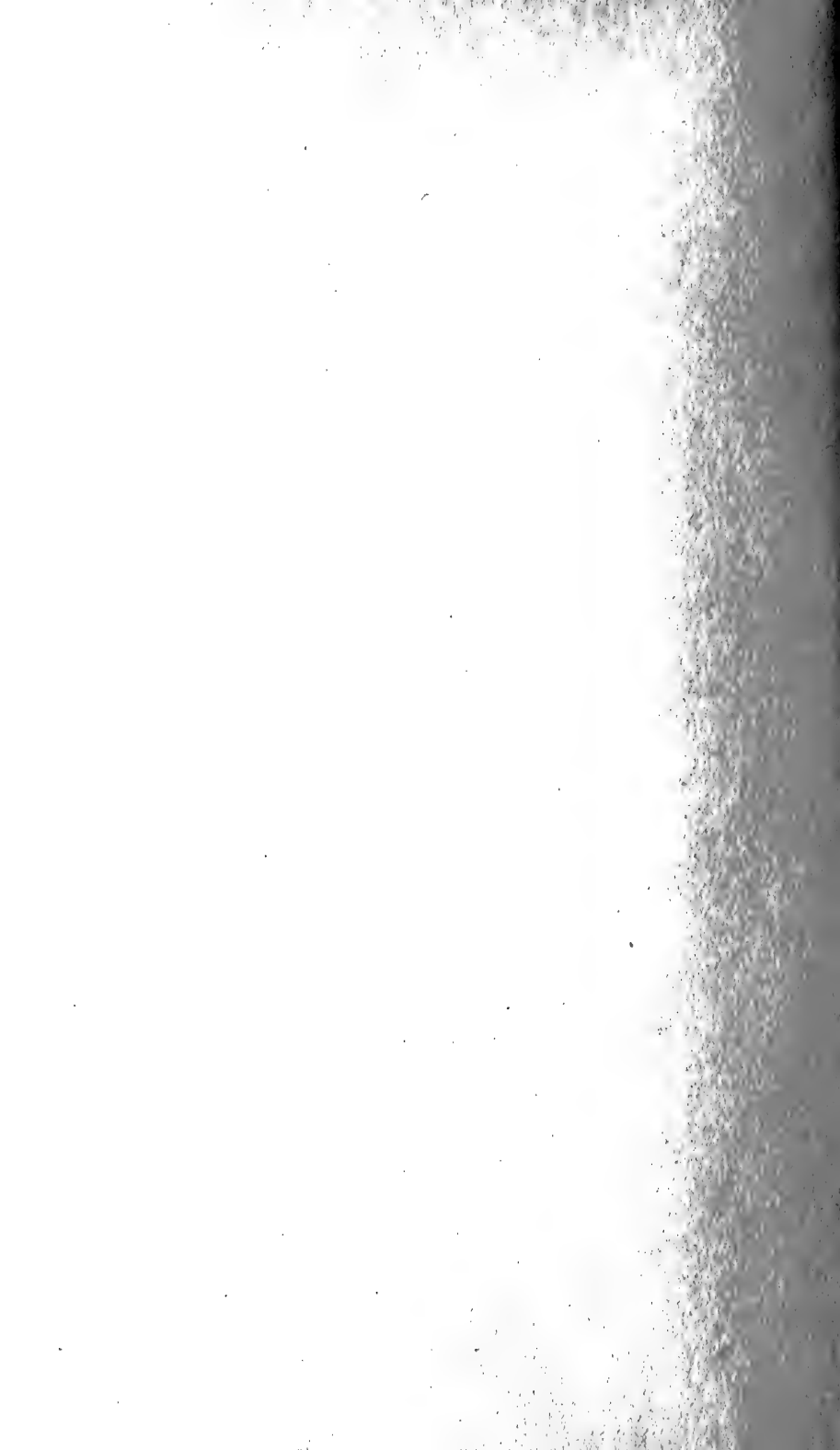
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LEAFLETS *of* WESTERN BOTANY

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SAN FRANCISCO, CALIFORNIA
FEBRUARY 19, 1954



NOTES ON WESTERN ANTIRRHINEAE

BY WERNER ROTHMALER

Greifswald, Germany

In preparing a monograph of the genus *Antirrhinum* I have been able to base my work on the excellent studies of Munz (1926), but, considering the whole genus in the world, I also have had to revise the American species. I found that there are some deficiencies in the study of the American material. First I will indicate the items not sufficiently mentioned in the studies and herbaria of America.

The European student of western material will first observe that the indications about habitat and ecology are very rare and insufficient, and the same must be said about the geographic notes on site, soil, altitude, and plant communities. Labels containing only the name of a small town without the indication of district or state, with the date of collection and perhaps the name of the collector are frequent. Because of this lack of data, a monographer finds it very difficult to make a profound study: and this precisely in California, the land with the most important tradition of ecology in the world.

Modern taxonomic study needs these data for good work. New methods and investigations of morphologic-geographic relations cannot be pursued, while maps of isoporic lines (E. Hofmann, 1873; Rothmaler, 1938) and isopsephic lines (Rothmaler, 1938) are often impossible to construct. It must also be said here that the floristic study of California and the adjacent lands must be intensified, as some authors have done, *e.g.*, in the genera *Delphinium* or *Quercus*.

Especially in *Antirrhinum* have data been ignored about the biology of the American species, matters that are better known in European material. About many species we do not know whether they are annual, biennial, or perennial. The time of flowering is not indicated in the revision of Munz. About the visitors (insects) that pollinate the flowers I have found no indication. Nothing is known about the fertility, whereas European species are known as self-sterile in the major part. Some American species of *Antirrhinum* also seem to be self-sterile, others doubtlessly are self-fertile, and a few are certainly autogamous or cleistogamous. There are no indications at all about the chromosome numbers of the American species.

It is easy to find that even in this genus there is much room for exploration and important study. With the few notes and the material sent to me through the kindness of J. T. Howell and of the New York Botanical Garden I find it necessary to make some observations, partly published, partly unedited, about the *Antirrhineae*. In 1934 I proposed to modify the system of this group respecting the American species in the following manner:

Scrophulariaceae-Antirrhinoideae-Antirrhineae

1. Subtribe MAURANDYINAE Rothm.

RHODOCHITON Zucc.

R. atrosanguineum (Zucc.) Rothm.

LOPHOSPERMUM D. Don

L. erectum (Hemsley) Rothm. (*Maurandia erecta* Hemsley)

L. scandens D. Don (*Maurandia Lophospermum* Bailey)

L. erubescens D. Don

L. Purpusii (Brandege) Rothm. (*Maurandia Purpusii* Brandege)

EPXIPHIMUM (Engelm.) Munz

E. Wislizeni (Engelm.) Munz

MAURANDYA Ortega

M. scandens (Cav.) Pers. (*M. semperflorens* Ortega)

M. Barclaiana Lindl.

M. acerifolia Pennell

M. geniculata Rob. & Fern.

M. Rosei Munz

M. flaviflora Johnst.

M. petrophila Brandege

MAURANDELLA (A. Gray) Rothm.

M. antirrhiniflora (HBK.) Rothm. (*Antirrhinum maurandioides* A. Gray)

M. hederæfolia Rothm.

2. Subtribe GAMBELIINAE Rothm.

GALVEZIA Domb.

G. fruticosa Gmel.

G. Ballii Munz

SACCULARIA Kellogg

S. juncea (Benth.) Rothm. (*S. Veatchii* Kell.)

S. glabrata (Brandege) Rothm.

S. rupicola (Brandege) Rothm.

GAMBELIA Nutt.

G. speciosa Nutt.

3. Subtribe LINARIINAE Rothm.

CYMBALARIA Hill

C. muralis G. M. Sch. (*Antirrhinum Cymbalaria* L.)

KICKXIA Dum. (1827). *Tursitis* Raf. (1840); *Elatinoides* Wettst. (1891)

K. spuria (L.) Dum.

K. Elatine (L.) Dum.

LINARIA Mill.

- L. canadensis (L.) Dum.
- L. floridana Chapman
- L. repens (L.) Mill.
- L. sepium J. G. Allm.
- L. vulgaris Mill.
- L. pinifolia (Poiret) Munz
- L. purpurea (L.) Mill.
- L. spartea Link & Hoffgg.
- L. dalmatica (L.) Mill.
- L. genistifolia (L.) Mill.

CHAENORRHINUM Lange

- C. minus (L.) Lange

ANTIRRHINUM L.

(The species see below.)

HOWELLIELLA Rothm.

(The species see below.)

NEOGAERRHINUM Rothm.

- N. strictum (Hook. & Arn.) Rothm. (*Maurandia stricta* Hook. & Arn.;
Antirrhinum strictum A. Gray, non Sibth. & Sm.)
- N. filipes (A. Gray) Rothm. (*Antirrhinum filipes* A. Gray)

PSEUDORONTIUM (A. Gray) Rothm.

- P. cyathiferum (Benth.) Rothm. (*Antirrhinum chytriospermum* A.
Gray)

MISOPATES Raf.

- M. Orontium (L.) Raf. (*Antirrhinum Orontium* L.)

4. Subtribe MOHAVEINAE Rothm.

MOHAVEA A. Gray

- M. confertiflora (Benth.) Heller (*M. viscida* A. Gray)
- M. breviflora Coville

THE GENUS HOWELLIELLA

Considering this system of the tribe and the relations of the different genera of the world, I am obliged to publish a new genus that is closely related to *Antirrhinum* sect. *Saerorhinum*. But while the other genera of the subtribe *Linariinae* seem to have originated from ancestors now much transformed or extinct, the ancestor of the new genus, I suppose, can be precised in the series *Axilliramulosa* of this section *Saerorhinum*:

Howelliella Rothm., nov. gen. (*Antirrhinum* sect. *Eastwoodiella* Munz.) Affinis gen. *Antirrhini* sect. *Saerorhini* ser. *Axilliramulosis*, a qua differt corolla aperta (haud palato fauce clausa), tubo basi angusto, gibba saccata fere calcarato, dein inflato ventricoso infra intraque lineis duabus longitudinalibus gibboso-elevatis brunneis signato, labiis late apertis, superiore lobulis duobus erectis, inferiore longiore lobulis tribus reflexis praedita.

Typus et species unica: **Howelliella ovata** (Eastw.) Rothm., nov. comb. (*Antirrhinum ovatum* Eastw., Bull. Torr. Bot. Club 32: 213,—1905.)

Hab. California: San Luis Obispo County; Monterey County.

The new monotypic genus is closely related to *Antirrhinum* and only differs by the wide open corolla; with the little branches in the axils of the leaves and the inequality of the sepals it seems to be a species of *Axilliramulosa*. The characters of the corolla are important in the whole tribe, so I am of the opinion that this plant must be considered a genus by itself. I dedicate this genus to John Thomas Howell, who studied specially this species and who forwarded some seeds to me. Thus I was able to become acquainted with this species. More data about the unique species, *H. ovata*, first discovered in 1902 and rediscovered in 1948, will be found in Howell's account, The rediscovery of *Antirrhinum ovatum*, Leaflet West. Bot. 5:184, 185 (1949).

THE GENUS ANTIRRHINUM L. EMEND. ROTHM.

The genus *Antirrhinum* is composed of two sections, one of which we find only in Europe (especially western Mediterranean), the other exclusively in America.

SECT. ANTIRRHINASTRUM Chavannes. Two species of this European section are also observed subspontaneously in America:

ANTIRRHINUM TORTUOSUM Bosc. (*A. montevidense* Martius). This species I saw from America only in f. *glandulosum* with glandular inflorescence (while the typical f. *tortuosum* is always glabrous). *Antirrhinum tortuosum* is akin to *A. majus* from which it differs by linear and generally opposite leaves; also the mostly larger, purple or white flowers are generally opposite. The species, originally spontaneous in the southwestern Mediterranean Basin, was cultivated in Roman times and distributed subspontaneously in the whole Mediterranean. By the Spanish colonization of America, the plant was brought to the New World. I have seen material from Chile, Uruguay, Brazil, and Mexico (*Uhde*, B; *Aschenborn*, B; *Queretaro*, *Arsène* 10,520, NY); also from Havana and Santiago de las Vegas, Cuba (*Van Hermann* 846, 5154, NY); and from Florida (*Cabanis*, B).

ANTIRRHINUM MAJUS L. em. Mill. In America this species is cultivated and subspontaneous in its ssp. *majus* var. *majus*. The leaves are lanceolate to ovato-lanceolate, and the upper ones, as also the flowers, are generally alternate. The flowers are large, purple in the wild forms in the Pyrenees Mts. and in the cultivated and subspontaneous forms, but frequently the latter are also of different colors. This species was cultivated in medieval times but was introduced to America probably much later than

A. tortuosum. Today it seems to be the only cultivated species, but is frequent in the United States.

Sect. SAERORHINUM A. Gray. The indigenous American species of this genus form the section *Saerorhinum* differing from *Antirrhinastrum* (with longer upper and shorter lower lip) in the notably longer lower lip with the middle lobe longer than the lateral ones. These species are treated by Munz in his revision and my own opinion does not essentially differ from that treatment. Here I only want to note that the series *Axilliramulosa* needs a more intensified study in the field.

Series AXILLIRAMULOSA A. Gray. This series is characterized by the unequal sepals, the upper greater than the others, and by the little lateral branches in the floriferous axils of the leaves. The chorologically, ecologically, and morphologically characterized species of this series are: *A. subcordatum* A. Gray from the interior of central California with large ovate or cordate-ovate leaves and bracts; *A. vexillo-calyculatum* Kellogg (*A. vagans* A. Gray) with lanceolate leaves and bracts from the littoral of central California; *A. Breweri* A. Gray with fine and velutinous pubescence and lanceolate or ovate leaves from Oregon, northern California, and continental central California; and a new species, **A. Elmeri*** Rothm., glabrous with linear leaves and bracts from the southern littoral of central California.

In this series it may be possible to discover some new forms; this will depend on profound field-work. The differences between the form of the leaves in *A. vexillo-calyculatum* and *A. subcordatum* (very similar in their indumentum) need to be confirmed in the field, but the other species, by indumentum and by form of leaves, bracts, and sepals, are plainly limited species.

I hope that these notes will promote a more intense study of this group by the botanists of western America.

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***Antirrhinum Elmeri** Rothm., nov. spec. Caulis glaber. Bracteae et folia linearia, 1-2 (raro 4) mm. lata. Sepala lanceolata acuta, 4 mm. longa, postico oblongo obtuso, 8 mm. longo. Typus: Contra Costa Co., Mt. Diablo, *Elmer 4809* (B, CAS, W, NY), Co-typi: Santa Clara Co., Loma Prieta, *Elmer 4983* (B, NY); New Almaden, *Torrey* (NY).

NOTES ON MALVACEAE V

BY THOMAS H. KEARNEY

Pavonia Rhizophorae Killip, spec. nov. Frutex usque ad 1.2 m. altus vel fortasse aliquando arborescens; caulibus supra ramosis, breviter stellato-pubescentibus mox glabrescentibus; foliis et pedunculis, atque involucellis, calycibus, et petalis extrinsecus, parce et breviter stellato-pubescentibus; petioliis quam lamina multo brevioribus; foliorum lamina lanceolatis, ovato-lanceolatis, vel ellipticis, aliquando subobovatis, usque 14 cm. longis, basi subcuneatis, apice gradatim vel abrupte acuminatis, parce dentatis vel denticulatis, e basi 3-nervatis, crassiusculis, fere concoloribus; floribus in racemis terminalibus elongatis dispositis, inferioribus paulo longe pedunculatis; pedunculis validis, non manifeste articulatis; involucello calyce brevioris, 5-8 phyllis composito, phyllis fere distinctis, lanceolatis, acutiusculis usque ad acuminatis, 6.5-10 mm. longis, basi 1.5-3 mm. latis; calyce campanulato, intus subtiliter tomentoso, 10-15 mm. longo, fere ad medium partito, lobis deltoideo-ovatis, acutis; corolla paulo anguste campanulata, 20-25 mm. longa, albo-viridi vel roseo-aurea; petalis erectis, convolutis, anguste obovatis, gradatim contractis in unguibus longiusculis, insigniter plurivenosis; tubo stamineo et corolla subaequilongi, tubo valido, breviter pubescente, filamenta pauca versus apicem gerente, antheris flavo-viridibus; stigmatibus magnis, discoideis, concavis; carpellis anguste obovoideo-trigonis, valde carinatis, paulo obscure transverso-rugosis, glabris vel glabriusculis, fere 8 mm. longis, cuspidatis, cuspe valida, triangulare, usque ad fere 3 mm. longa.

A shrub, up to 1.2 m. high, or perhaps sometimes arborescent; stems branched above, shortly stellate-pubescent, soon glabrescent; leaves, peduncles, and the outer surface of the involucl, calyx, and corolla sparsely and shortly stellate-pubescent; petioles up to $\frac{1}{3}$ as long as the leaf-blade, the blades lanceolate, ovate-lanceolate, or elliptic, sometimes slightly obovate, up to 14 cm. long, $\frac{1}{4}$ - $\frac{2}{5}$ as wide as long, subcuneate at base, attenuate-acuminate or sometimes shortly and somewhat abruptly acuminate, sparingly dentate or denticulate, 3-nerved from the base, thickish, nearly concolorous; flowers in elongate terminal racemes, the lower flowers rather long-pedunculate, the peduncles stout, enlarged at apex, not evidently articulated, up to 2 cm. long; involucl about $\frac{2}{3}$ as long as the calyx, composed of 5-8 bractlets, these nearly distinct, lanceolate, acutish to acuminate, 1.5-3 mm. wide at base; calyx campanulate, finely tomentose within, 10-15 mm. long at anthesis, cleft to about the middle, the lobes deltoid-ovate, acute; corolla rather narrowly campanulate, 20-25 mm. long, greenish-white or pinkish-yellow (collectors' notes), the petals erect, convolute, narrowly obovate, gradually contracted into a rather long claw, conspicuously many-veined; stamencolumn nearly or quite as long as the corolla, stout, shortly pubescent, the relatively few filaments subapical, the anthers yellowish-green; stigmas large, discoid, concave; carpels narrowly obovoid-trigonal, strongly carinate, rather obscurely transverse-rugose, glabrous or nearly so, the body about 8 mm. long, with a single stout, triangular, apical cusp up to nearly 3 mm. long and about 1 mm. wide at base, the dorsal keel of the carpel extending to the base of the cusp, the latter probably splitting into 2 cusps at full maturity, when the carpel seemingly dehisces along the ventral suture.

Known only by the following collections in Colombia: Departamento El Valle, Buenaventura Bay, *Killip & Cuatrecasas 38834*, U. S. Nat. Herb. No. 1856344, the type, isotype in Herb. Calif. Acad. Sci. No. 380374; *Killip 33007*. Departamento Chocó, banks of Quebrada Togoromá, *Killip & Cuatrecasas 39131*. Grows in coastal thickets and forests that are inundated at high tide.

Pavonia Rhizophorae evidently is related to *P. spicata* Cav., and forms with it a very distinct group in Section *Eupavonia*. The new species differs from *P. spicata* in its much narrower leaf-blades, these contracted and subcuneate (not broad and shallowly cordate) at base, and 3- (not 5-7-) nerved from the base. The two species are also strikingly different in the carpels, those of *P. Rhizophorae* having a single (finally splitting?) stout apical cusp instead of the 3 apical crests of *P. spicata*. Also the involucler is shorter, relative to the calyx, than is usual in *P. spicata*. Apparently these are the only American species of *Pavonia* that grow in association with mangroves.

PAVONIA ALBA Seem., Bot. Voy. Herald 81 (1853). *Malache panamensis* Standley, Contr. U. S. Nat. Herb. 18:116 (1916). *Pavonia panamensis* (Standley) Standley, Jour. Wash. Acad. Sci. 17:168 (1927).

Through the courtesy of the directors of the Royal Botanic Gardens, Kew, and the U. S. National Herbarium, the type of *Pavonia alba* (Seeman 90 in 1846) and that of *Malache panamensis* (Standley 26846), both from Panama, were made available to me for comparison. They proved to be conspecific, the two type specimens being so similar, in fact, that they could be taken for duplicates of the same collection, were not the Seemann specimen so much older. This species, of Section *Eupavonia*, is notable in having a smaller corolla than any other of the American species of *Pavonia*, this being only 4-5 mm. long. The species is unusual also, although not unique, in the white color of the petals.

BOGENHARDIA vs. GAYOIDES. Ingr. Antonio Krapovickas has brought to my attention the fact that there are two older names—*Herissantia* Medik. (1789) and *Bogenhardia* Reichenb. (1841)—for the small genus that has been known in recent years as *Gayoides*, J. K. Small (1903).¹ *Herissantia* was not effectively

¹ See Kearney, Thomas H. The American genera of Malvaceae. Amer. Midl. Nat. 46:115 (1951). I am indebted to Mr. C. V. Morton and Dr. S. F. Blake for appraisal of the validity of publication of the names *Herissantia* and *Bogenhardia*, respectively.

published under the International Rules, *Medikus* having merely cited, as synonym, *Sida crispa* Cav. (sic), without a word of description. The name *Bogenhardia*, on the other hand, appears to be valid. In pt. 1, p. 200 of his "Repertorium Herbarii sive Nomenclator Generum Plantarum," Reichenbach stated merely "7636. *Bogenhardia* Rchb. Pulchra *Sida crispa* L.;" but in pt. 2 of the same work, under the heading "Synonymorum Reducta," p. 48, he cited "Gayoides Endl. *Bogenhardia* Rchb." Referring to Endlicher's "Genera Plantarum," p. 986 (1839) we find, under *Bastardia*, two sections described as follows:

α. *Abutiloides*. Capsula haud inflata. Semen suspensum. *Sida bivalvis* Cav. Diss. t. 11, f. 2.

β. *Gayoides*. Capsula vesicularis. Semen adscendens. *Sida crispa* Linn. Cav. Diss. l.t. 7, f. 1, V. t. 135 f. 2.

This description of *Gayoides* (as a section), brief although it is, with citation of a previously published specific name, would seem to validate Reichenbach's publication of the generic name *Bogenhardia*. He made no specific combination, although "*Bogenhardia crispa* Reichb." is listed in Index Kewensis as a synonym of *A. (Abutilon) crispum*. I am therefore publishing the appropriate combination, as follows:

Bogenhardia crispa (L.), comb. nov. *Sida crispa* L., Sp. Pl. 685 (1753). *Abutilon crispum* (as *crispum*) Medik., Malvenfam. 29 (1787); Sweet, Hort. Brit. 1:53 (1826). *Gayoides crispum* Small, Fl. S.E.U.S. 764 (1903). *Pseudobastardia crispa* Hassler, Bull. Soc. Bot. Genève, ser. 2, 1:211 (1909).

Sida Killipii nom. nov. *S. ramosissima* Killip & Cuatrecasas, Rev. Acad. Colomb. 4:347 (1941), non (Presl) D. Dietr.²

This species is related to *S. spinosa* L., but differs in its profusely branched stems, much smaller leaves (less than 2 cm. long and not more than 3 mm. wide), smaller flowers (calyx 3-4 mm. long and the corolla not longer), and smaller fruits (carpels about 2 mm. long). Also the filiform peduncles are longer than is usual in *S. spinosa*, except in the Galápagos Islands, where a form superficially somewhat similar to *S. Killipii* (*S. tenuicaulis* Hook. f.) seems to be common. The flowers of *S. Killipii* are relatively few and are strictly solitary, whereas, in *S. spinosa*, some of them frequently occur in small axillary and terminal glomerules.

² *Sida ramosissima* D. Dietr. (1847) was based on *Abutilon ramosissimum* Presl (1835), which generally is regarded as synonymous with *A. incanum* (Link) Sweet.

Hibiscus Brittonianus, nom. nov. *H. bahamensis* Britton, Bull. N. Y. Bot. Gard. 4:120 (1906), non Mill. (1768).

It is impossible to determine, from Miller's brief description (Gard. Dict. ed. 8, *Hibiscus* No. 14) what his plant was, but it could not have been the same species as *H. bahamensis* Britton. Hochreutiner, in his monograph of *Hibiscus* (Ann. Conserv. et Jardin Bot. Genève 4:140) cited *H. bahamensis* Mill. doubtfully as a synonym of *H. palustris* L., in which species he included *H. Moscheutos* L., but Urban (Repert. Sp. Nov. 16:33) concluded that the identity of Miller's plant "kann bei der Kürze der Diagnose nur durch einen Vergleich des Originals entschieden werden. In letzterem Falle müsste die Brittonsche Pflanze einen neuem Namen erhalten." Miller gave no indication of locality except in the specific name, and *H. bahamensis* Britton is the only species of *Hibiscus* listed in Britton and Millspaugh, The Bahama Flora (1920, p. 272).

SIDA TULLA Ulbrich, Notizbl. Bot. Gart. und Mus. Berlin 11: 534 (1932). This interesting plant apparently is known only by the type collection at Santa Ana on the Urabamba River, Dep. Cuzco, Peru (*Cook & Gilbert 1505*, U. S. Nat. Herbarium No. 604683). The specimen has excellent leaves and flowers but no fruit. It bears a remarkable resemblance to the likewise Peruvian, hitherto monotypic genus, *Tetrasida*, Ulbr. (*T. polyantha* Ulbr.) in its thickish, strongly discoloured, ovate-lanceolate, cordate, attenuate-acuminate, entire-margined leaves, laxly paniculate flowers, and somewhat unequally 4-lobed, rounded-campanulate calyx. In *S. Tulla*, however, the leaves are broader, with a more open basal sinus, their stellate hairs are somewhat longer, and the flowers are larger in all their parts. The globose flower buds, deeply reniform anthers, and large, capitate stigmas are especially noteworthy. The plant, like *Tetrasida*, is probably a large shrub or a small tree.

The calyx of *S. Tulla* is so different from all other American species of *Sida* as to exclude it from that genus. This plant may prove to be a second species of *Tetrasida*, but until fruit is available, the relationship remains uncertain. The type of *S. Tulla* came from much farther south (lat. about 13°S.) than the 4 collections of *Tetrasida polyantha* recorded by Ulbrich (Bot. Jahrb. Beibl. 117:68 and Notizbl. Berlin 11:533) which all came from lat. 5° to 6° S.

A TENTATIVE KEY TO THE NORTH AMERICAN SPECIES OF PAVONIA, CAV.

BY THOMAS H. KEARNEY

This key to the North American species of *Pavonia*, Cav., is presented in the hope that it may prove useful in identifying specimens of this large genus. With this end in view, it has been based mainly upon easily ascertainable characters, and therefore it is largely an artificial key. Whenever possible, the characterizations have been drawn from herbarium specimens, supplemented by published descriptions; but not a few of the species are little known, and in these cases, such descriptions have been the main, or even the only source of information. This is always unsatisfactory, as authors often omit in their diagnoses the very characters which have been relied upon, chiefly, in formulating the divisions of the key.¹ The West Indies and Panama are included in the area covered.

1. Involucel-bractlets 7-12, stipe-like, more or less rigid, expanded abruptly at apex into a thickish, often reflexed, usually more or less peltate bladelet. Flowers subtended by large, foliaceous bracts; corolla yellow, 15-20 mm. long; carpels broadly obovoid-trigonous, mucicous or very nearly so, carinate (2).
1. Involucel-bractlets sometimes spatulate but not stipe-like and expanded at apex as above (3).
2. Leaves 7-9-nerved, more or less tomentose; carpels glabrous. Costa Rica and Panama; northern South America. *P. sessiliflora* H.B.K.
2. Leaves 3-5-nerved, puberulent or sparsely rough-pubescent; carpels pubescent. Panama; northern South America. *P. Preslii* Standley. Note 1²
3. Carpels aristate or cuspidate, the awns or cusps usually retrorsely hispid or pilose: Section TYPHALAEA (4).
3. Carpels (except sometimes in *P. paniculata?*) mucicous or merely mucronate or crested: Section EUPAVONIA (18).
4. Apical awn or cusp single, but accompanied by 2 subapical tubercles. Leaves velutinous beneath; bractlets 5, shorter than the calyx; petals 30-50 mm. long. Cuba
. *P. achanioides* Griseb. var. *tuberculata* R. E. Fries. Note 2
4. Apical awns or cusps 3, these (in *P. cancellata*) sometimes nearly obsolete (5).
5. Bractlets 5-7 (rarely 8?), less than twice as long as the calyx, commonly long-ciliate (6).

¹ Information is lacking for including in this key: *P. glandulosa* Presl (Mexico), *P. heterophylla* Turcz. (Mexico), *P. hispida* Wright (Cuba), and *P. urticaefolia* Presl (Mexico). *Pavonia glandulosa* was referred in Index Kew. to *P. hirtiflora* Benth., but the descriptions indicate quite different plants.

² Notes will be found in the section following the key.

5. Bractlets generally 8 or more (7).
6. Petals 2-4 cm. long, yellow; leaves cordate to rounded at base, broadly ovate to ovate-lanceolate; bractlets nearly distinct, narrowly oblanceolate; flowers solitary; carpel-awns variable in length, the lateral ones often strongly divergent. Southeastern U. S., West Indies, and Mexico to South America *P. Spinifex* (L.) Cav.
6. Petals less than 2 cm. long, white (or pink?); leaves cuneate to rounded (exceptionally subcordate) at base, oblong-elliptic or obovate; bractlets united about $\frac{1}{4}$ (rarely $\frac{1}{2}$?) of their length, broadly lanceolate to ovate, commonly 2-4 mm. wide; flowers mostly in dense, subcapitate terminal inflorescences; carpel-awns subequal, usually elongate, the lateral ones erect or ascending. West Indies and Mexico to South America *P. fruticosa* (Mill.) Fawc. & Rend. Note 3
7. Involucel shorter than to equaling the calyx. Bractlets 8-10 (8).
7. Involucel longer than the calyx (11).
8. Bractlets united well above the base; leaves entire or nearly so, oblong-oblanceolate, cuneate at base, short-acuminate; flowers umbellate-cymose, the slender peduncles (always?) longer than the leaves, the pedicels also elongate. Herbage glabrescent; carpels carinate, obscurely veined, glabrous except the awns. Mexico, Guatemala. *P. integrifolia* Standley
8. Bractlets distinct or united only at base, subulate, linear, or narrowly spatulate; leaves not entire; flowers solitary in the axils (9).
9. Flowers pendulous; leaves elliptic, elliptic-oblong, or obovate, serrate, up to 15 cm. long. Corolla pink, 12 mm. long; carpels coarsely reticulate, the awns little more than $\frac{1}{2}$ as long as the body. Known only from Panama *P. penduliflora* (Standley) Standley. Note 4
9. Flowers not pendulous; leaves linear-lanceolate, denticulate, up to 5 cm. long. Cuba (10).
10. Stems subtrigonus, subtomentose with stellate hairs; leaves coriaceous; petals 20 (?) mm. long *P. linearis* A. Rich. Note 5
10. Stems terete, puberulent and with a line of tomentose pubescence; petals about 10 mm. long. Carpel-awns shorter than the body. *P. intermixta* A. Rich.
11. Leaves not more than 6 cm. long. Flowers solitary, the peduncles usually elongate; bractlets numerous, filiform, conspicuously hirsute; carpel-awns short and relatively stout (12).
11. Leaves normally more than 6.5 cm. long (13).
12. Stems erect; leaves ovate or ovate-lanceolate, rounded or subcordate at base, long-acuminate, serrate; bractlets fewer than 14, 3-4 times as long as the calyx; petals about 12 mm. long, yellow. Southern Mexico (Guerrero) *P. arachnoidea* Presl
12. Stems prostrate; leaves subdeltoid, often shallowly lobed, deeply cordate or hastate-cordate, obtuse or acute, crenate or crenate-serrate; bractlets usually 14 or more, up to about twice as long as the calyx; petals 18-25 mm. long, yellow with a dark purple basal spot. Southern Mexico (Oaxaca); South America *P. cancellata* (L.f.) Cav. Note 6
13. Bractlets united well above the base, often at least $\frac{1}{3}$ their length, the involucel considerably longer than the calyx. Leaves more or less

- obovate; flowers mostly in terminal corymbiform or subcapitate inflorescences (14).
13. Bractlets distinct, or (except sometimes in *P. rosea*?) united not more than $\frac{1}{4}$ their length (15).
14. Middle awn of the carpel about equaling the body; leaves coarsely and irregularly dentate, 10–20 cm. long; bractlets 9 or 10. Trinidad (?), southern Brazil *P. castaneaefolia* St. Hil. & Naud. Note 7
14. Middle awn shorter than the carpel body; leaves crenulate or serrulate, up to 30 cm. long, glabrous above, sparsely puberulent beneath; bractlets about 8. Peduncles (flowering branches?) up to 35 cm. long; petals purple. Costa Rica, Panama *P. longipes* Standley
15. Stems hirsutulous with short, whitish, forked or stellate hairs; flowers mostly in short, more or less dense corymbiform or subcapitate terminal clusters. Involucel of usually 8–10 linear or narrowly lanceolate bractlets, these united toward base, 0.5–2 mm. wide, 1–3-nerved; petals 10–15 mm. long, pink or white. West Indies and Mexico to Colombia and Brazil *P. rosea* Schlecht. Note 8
15. Stems copiously hirsute or hispid with yellowish or fulvous hairs; flowers solitary, binate, or in clusters of 3 or 4 (16).
16. Leaves obovate or oblanceolate; petals pink. Flowers solitary; bractlets of the involucel 10–12. Costa Rica, Panama
. *P. Maxonii* (Standley) Standley
16. Leaves oblong-elliptic or elliptic-lanceolate (exceptionally slightly obovate); petals white (17).
17. Stipules 8–10 mm. long; flowers solitary or in corymbose clusters of 3 or 4; bractlets 10, about $1\frac{1}{2}$ times as long as the calyx; fruit unknown. Jamaica (?), Colombia *P. pseudotyphalaea* Planch. & Lind.
17. Stipules 3–5 mm. long; flowers solitary (rarely binate?); bractlets 11 or more, 2–4 times as long as the calyx; carpel-awns subequal, spreading, longer than the body. Costa Rica, Panama, Peru
. *P. oxyphyllaria* Donn. Smith. Note 9
18. Bractlets 5 or 6. Flowers mostly solitary in the axils (19).
18. Bractlets (except occasionally in *P. alba*, *P. chiapensis*, *P. paniculata*, *P. spicata*, and (?) *P. troyana*) more than 6 (31).
19. Leaves not lobed above the base or obscurely angulate-lobed. Bractlets distinct or nearly so (20).
19. Leaves, all or some of them (except in *P. cryptocalyx* and *P. hotteana*) often more or less deeply lobed above the base. West Indian species (23).
20. Bractlets ovate or obovate, not longer than the calyx. Herbage finely stellate-canescens; carpels reticulate, strongly carinate (21).
20. Bractlets subulate to narrowly oblanceolate, longer than the calyx. Leaves ovate to lanceolate, cordate at base; corolla 12–20(25?) mm. long, mauve or pale purple; carpels glabrous, lightly reticulate (22).
21. Leaves usually oblong-lanceolate and more than twice as long as wide, sagittate or hastate at base. Corolla purplish-pink, usually with a conspicuous dark center. Georgia, naturalized from South America
. *P. hastata* Cav.

21. Leaves deltoid or deltoid-oblong, deeply cordate or subsagittate. Northern Mexico *P. nepetaefolia* (Standley) Standley. Note 10
22. Herbage without glandular hairs, subvelutinous; leaves coarsely toothed, acutish; corolla without a conspicuous dark center, the petals ciliate on the claws; stamen-column not appendaged. Southern Texas to northeastern and (?) central Mexico *P. lasiopetala* Scheele. Note 11
22. Herbage glandular-pilose, and with non-glandular pubescence; leaves crenate, long-acuminate; corolla with a conspicuous nearly black center, the petals glabrous on the claws; stamen-column, near the base, bearing numerous thin, spatulate to broadly obovate, erose, dark colored appendages (a character that may be unique in the genus). Southern Mexico *P. melanommata* Robins. & Greenm.
23. Involucel-bractlets united well above the base, the lobes triangular, 3-5 mm. wide at base. Leaves $\frac{2}{3}$ - $\frac{3}{4}$ as wide as long; calyx only slightly longer than the involucel; petals 10-12 mm. long, about twice as long as the involucel, purple when dry; carpels strongly tuberculate, densely short-pilose. Hispaniola *P. cryptocalyx* Urban
23. Involucel-bractlets (in *P. achanoides*?) distinct or nearly so, and (except in *P. hotteana*) much narrower (24).
24. Bractlets not or but slightly more than $\frac{1}{2}$ as long as the calyx, linear or narrowly linear-lanceolate. Plants shrubby (25).
24. Bractlets much more than $\frac{1}{2}$ as long as the calyx (28).
25. Corolla up to 5 cm. long, tubular below, the petals spreading or reflexed above, scarlet or crimson. Leaves about $\frac{2}{3}$ as wide as long, the lateral lobes short, obtuse, the mid-lobe elongate, acuminate; carpels winged dorsally toward apex and with wing-like lateral tubercles. Hispaniola *P. coccinea* Cav. Note. 12
25. Corolla much less than 5 cm. long, the petals (so far as is known) not reflexed (26).
26. Petals not more than 15 mm. long, red; leaves small, up to 3 cm. long. Herbage very finely and densely stellate-tomentose, with a few longer, few-armed, setose hairs; leaves thickish, discolorous, mostly 3-lobed, crenate-dentate, the veins very prominent beneath; carpels strongly carinate, very rugose-tuberculate. Cuba. *P. calcicola* (Britton) Ekman
26. Petals 25-30 mm. long, pink or purple; leaves larger. Stems with 2-4-armed, setose hairs, also tomentulose in lines (27).
27. Androecium and styles not, or barely, surpassing the campanulate corolla; leaves 5-10 cm. long, $\frac{1}{3}$ to $\frac{1}{2}$ as wide, sometimes lobed nearly to the middle, sometimes ovate-lanceolate and merely crenate, cordate or subcordate at base, attenuate-acuminate, sparsely appressed-pubescent on both surfaces with setose hairs; carpels smooth, glabrous. Bractlets reflexed; corolla rose or scarlet. Hispaniola. *P. leiocarpa* Urban
27. Androecium and styles much surpassing the funnelform corolla; leaves up to 5.5 cm. long, nearly as wide, irregularly crenate-dentate, sometimes shallowly 3-lobed; carpels rugose, puberulent. Bractlets sometimes 6. Hispaniola *P. Ekmanii* Helwig
28. Bractlets 2.5-3 mm. wide at base, usually longer than the calyx. Plant shrubby, divaricate-scandent (Note 13); leaves ovate-lanceolate, truncate or subcordate at base, long-acuminate, deeply and irregularly

- serrate, sparsely and shortly stellate-pilose, with a few longer, setose hairs beneath; corolla tubular, yellowish-red, about 3 cm. long; androecium long-exserted; carpels dorsally subcarinate. Hispaniola *P. hotteana* Helwig
28. Bractlets much narrower (29).
29. Corolla purple, less than 15 mm. long, the petals shortly lobed on one side, much shorter than the androecium. Herbage densely velutinous with very short hairs; leaves $\frac{2}{3}$ - $\frac{4}{5}$ as wide as long; flowers solitary in the axils; bractlets sometimes 6; stamens dimorphic, some with longer, erect filaments, others with shorter, reflexed filaments; carpels glabrous, obliquely costate on the sides, the nerves sometimes cristate. Cuba *P. heterostemon* Urban
29. Corolla red or orange-scarlet, 35 mm. or longer, the petals not (?) lobed, nearly or quite as long as the androecium (30).
30. Carpels dorsally carinate, reticulate-veiny, puberulent; leaves 5-7.5 cm. long, 3-5-lobed. Cuba *P. achanoides* Griseb. Note 14
30. Carpels winged or crested dorsally; leaves 3.5-5 cm. long, 3-lobed, impressed-punctate beneath. Hispaniola *P. punctata* Urban
31. Bractlets 15 or more. Stems hirsute with long, simple hairs; leaves rounded-angulate or ovate-deltoid; flowers mostly solitary, long-pedunculate (32).
31. Bractlets 12 or fewer (33).
32. Leaves acute at apex, about 3.5 cm. long and wide, deeply cordate; bractlets about 16, filiform, 15-20 mm. long and about twice as long as the calyx, hirsute with very long, simple hairs; calyx cleft nearly to the base; petals 20 mm. long, yellow (?) with a dark purple basal spot; carpels obovoid-trigonous, carinate, slightly notched at apex, rugose. Costa Rica *P. guanacastensis* Standley. Note 15
32. Leaves long-attenuate-acuminate, up to 10 cm. long, rounded, hastate, or cordate at base, often shallowly 3-lobed; bractlets 18-20, subulate, about 10 mm. long, copiously long-ciliate; calyx cleft to the middle; petals 30-35 mm. long, lilac; carpels not carinate. Flowers often 4-merous. Mexico (Michoacan, Guerrero) . . *P. Langlassei* Hochr. Note 16
33. Flowers axillary, mostly solitary (34).
33. Flowers in racemose, corymbiform, or paniculate terminal inflorescences (41).
34. Petals 35-50 mm. long. Cuba (35).
34. Petals not more than 30 mm. long (36).
35. Leaves 3-5-lobed; bractlets 5-7, linear. (See also first paragraph 30.) *P. achanoides* Griseb.
35. Leaves not lobed; bractlets 8, spatulate *P. speciosa* H.B.K. Note 17
36. Petals 4-5 mm. long, white. Stems cinereous-puberulent; leaves ovate to lanceolate, rounded or shallowly cordate at base, long-acuminate, crenate-serrate, nearly concolorous; flowers numerous, the inflorescence an elongate, much-branched, leafy panicle; peduncles elongate, very slender; bractlets 6-8, linear, hirsute-ciliate; carpels subrotund, muticous, carinate, smooth and nearly glabrous, thin-walled, very dehiscent. Panama and Colombia *P. alba* Seem. Note 18
36. Petals 15 mm. or longer (37).

37. Herbage glabrous or nearly so; leaf-margins entire or merely sinuate; androecium greatly surpassing the corolla; carpels 2-lobed and with a central crest. Plants shrubby or arborescent; petals about 20 mm. long. Bahama Islands *P. bahamensis* A. S. Hitchc.
37. Herbage more or less puberulent; leaf-margins serrulate to coarsely toothed; androecium (in *P. chiapensis?*, *P. Purpusii?*) not surpassing the corolla; carpels otherwise (38).
38. Stems densely glandular-pilose, also more or less hirsute with long, spreading hairs; carpels very pubescent, lightly rugose-veiny. Leaves thin, ovate, up to 12 cm. long, $\frac{1}{2}$ - $\frac{2}{3}$ as wide as long, cordate, long-acuminate, sometimes very shallowly 3-lobed; petals purplish, 15-20 mm. long. Southern Mexico, Guatemala, Honduras.....
..... *P. Purpusii* Brandege. Note 19
38. Stems not glandular or somewhat so in *P. chiapensis*; carpels (except in *P. subpandurata?*) not very pubescent (39).
39. Leaves oblong-lanceolate, very slightly contracted above the base (subpanduriform), rounded or subcordate at base, serrulate. Herbage (especially the stems) tomentose; petals 20-30 mm. long. Cuba.....
..... *P. subpandurata* Wright. Note 20
39. Leaves ovate, cordate, more coarsely toothed. Petals 15-20 (25?) mm. long (40).
40. Herbage not glandular; leaves with an open basal sinus; involucl somewhat longer than the calyx; corolla mauve; carpels glabrous. (See also first paragraph 22.) Texas and Mexico..... *P. lasiopetala* Scheele
40. Herbage somewhat glandular; leaves with a usually closed basal sinus; involucl about twice as long as the calyx; corolla yellow with a purple center; carpels scabrous, rugose-veiny on the sides. Southern Mexico..
..... *P. chiapensis* (Standley) Standley. Note 21
41. Inflorescence an open, usually leafy panicle, the flowers often subcorymbosely clustered at ends of the branchlets. Herbage usually glandular-pilose, the stems with or without long, spreading hairs; leaves (usually broadly) ovate, often more or less trilobate; bractlets 6-12, subulate or filiform, much longer than the calyx; petals yellow; carpels obovovoid-trigonus, normally muticous, rugose. West Indies and Mexico to Argentina *P. paniculata* Cav. Note 22
41. Inflorescence otherwise, the flowers mostly in simple terminal racemes or corymbs (42).
42. Leaves not lobed or angulate. Plants shrubby or arborescent, up to 6 m. high; involucl somewhat shorter than the calyx, of 6-10 rather broad bractlets; petals yellowish or greenish (43).
42. Leaves 3-7-lobed or -angulate (44).
43. Bractlets (occasionally 10), lanceolate or oblong-lanceolate, 2-3.5 mm. wide at base; carpels not wing-margined. Herbage stellate-tomentose, then glabrescent; leaves broadly ovate or suborbicular, more or less cordate, the margins entire or denticulate; racemes usually elongate and very open; carpels elongate, rather narrowly trigonus, lightly reticulate, with a prominent keel and 3 thick, triangular, apical crests, these sometimes obscure. Florida, West Indies, Central America; northern South America *P. spicata* Cav. Note 23

43. Bractlets oblong or elliptic-oblong, up to 5 mm. wide at base; carpels more or less broadly wing-margined. Jamaica
 *P. troyana* (Urban) Urban. Note 24
44. Herbage glabrous or nearly so; bractlets narrowly spatulate. Leaves sub-orbicular, 25 cm. or longer and equally wide, rounded at apex, deeply cordate at base, 5-lobed with broad, triangular lobes; flowers in elongate terminal racemes; bractlets about 10, somewhat longer than the calyx; petals 12-14 mm. long; carpels glabrous, strongly carinate, transversely rugose dorsally. Mexico (Nayarit)
 *P. Ortegiana* (Standley) Standley
44. Herbage more or less pubescent; bractlets linear or narrowly lanceolate (45).
45. Involucel shorter than the calyx; petals 35-40 mm. long. Herbage copiously stellate-pubescent; leaves thickish, suborbicular, deeply cordate, obtuse to subacuminate, crenate or crenulate, up to 15 cm. long; inflorescence shortly racemose or corymbiform. Mexico (Jalisco)
 *P. firmiflora* Schery. Note 25
45. Involucel equaling or longer than the calyx; petals (in *P. racemifera*?) less than 25 mm. long. Carpels strongly carinate (46).
46. Terminal raceme short (?), the lower flowers axillary, their peduncles 2-3 times as long as the petioles of the subtending leaves; bractlets about 8, linear-subulate; leaves 5-angled, cordate, much less (?) than 30 cm. long; carpels pubescent. Mexico (Tepic) . . . *P. racemifera* Hook. & Arn.
46. Terminal raceme elongate, up to 30 cm. long, many-flowered, dense toward apex; bractlets 9 or 10, narrowly linear-lanceolate, often spreading or recurved at apex; leaves shallowly angulate-lobed, up to nearly 30 cm. long and wide, deeply cordate; carpels strongly carinate, otherwise smooth, obscurely puberulent. Petals yellow, about 15 mm. long. Mexico (Jalisco) *P. Palmeri* (Baker f.) Schery. Note 26

NOTES

1. Synonyms: *Malachra ovata* Presl, *Peltaea ovata* (Presl) Standley.
2. Fries (K. Sv. Vet. Akad. Handl. ser. 3, 242:26,t.3) thought this might be a distinct species, typical *P. achanioides* (first paragraph 30 of this key) having mucicous carpels. Fries figured but did not describe the central awn or cusp.
3. Synonym: *P. Typhalaea* Cav.
4. Basonym: *Malache penduliflora* Standley. Only the type (*Pittier 3118*) was cited by the author of the species (Contr. U. S. Nat. Herb. 18:117) but this is so poor a specimen that other material must have been the basis of Standley's detailed description.
5. Characters of *P. linearis* and *P. intermixta* mainly from A. Richard's descriptions (Essai Fl. Cuba, pp. 127, 128). In a collection by Roig & Acuña in 1940, identified as *P. intermixta*, the calyx is about 5 mm. long and the carpels are glabrous and longitudinally veiny.
6. A collection at Santa Lucrecia, Oaxaca (*Conzatti 3661½*), affords what seems to be the first record for North America.
7. It is doubtful that the Trinidad plant described under this name by Grisebach (Fl. Brit. West Ind. p. 82) is the same as the plant of southern

Brazil. Grisebach described the leaves as elliptic-lanceolate and the number of bractlets as 9-14.

8. Very like *P. fruticosa* in general appearance, differing chiefly in the more numerous, less united, narrower bractlets. Synonym (fide Fl. Bras.), *P. nemoralis* St. Hil. & Naud.

9. Synonyms: *P. costaricensis* Hochr., *P. fulva* (Standley) Standley.

10. This is very like, if not identical with, *P. hastata* var. *pubescens* Gürke f. *brevifolia* Gürke of southern South America. A collection on Socorro Island (*H. L. Mason in 1953*) seems to be the same.

11. Synonyms: *P. Wrightii* Gray and (?) *P. hirtiflora* Benth. If the type of the latter, insufficiently described species came from Aguascalientes, as stated by Standley (*Trees & Shrubs Mexico p. 773*) and if it is really synonymous with *P. lasiopetala*, the latter species ranges farther south than heretofore recorded.

12. Characters chiefly from Cavanilles' description and illustration (*Diss. 3:140, t. 47, f. 1*). Urban (*Symb. Antill. 5:420*) did not mention the reflexed petals but stated that the calyx is 2 or more times as long as the involucrel.

13. As described by R. M. Moscoso, *Cat. Fl. Doming. 363 (1943)*.

14. Bractlets 7 mm. long, calyx 11-12 mm. long, fide Helwig (*Repert. Sp. Nov. 24:235*). For other characters of *P. achanioides* see Urban (*Symb. Antill. 7:280*). The carpels are presumably muticous in typical *P. achanioides*, whereas in var. *tuberculata* (see first paragraph 4 of this key) they are apically cuspidate and bituberculate. The type of *P. achanioides* is *C. Wright 2066*. A specimen with this number in Herb. Univ. Calif. is *Hibiscus brasiliensis* L.

15. Evidently related to *P. cancellata* (L.f.) Cav., but the carpels are muticous and the plant was described as "elata." Compare second paragraph 12 of this key.

16. Hochreutiner suspected that the 4-merous condition is abnormal. There is no mention of long, simple stem-hairs in his description, although they are very conspicuous in the isotype at the University of California.

17. Synonym: *P. cordifolia* Wright, which is referred in *Fl. Bras. (123:495)* to *P. speciosa* H.B.K. var. *Hostmannii* (Miq.) Gürke.

18. Synonyms: *Malache panamensis* Standley, *Pavonia panamensis* (Standley) Standley.

19. Synonym: *P. Liebmannii* Ulbr.

20. Synonym: *P. speciosa* H.B.K. ssp. *genuina* Gürke var. *subpandurata* Gürke.

21. Resembles and is perhaps not specifically distinct from the South American *P. sidifolia* H.B.K.

22. Synonyms (?): *P. scabra* Presl, described from Mexico, and *Malache fonssecana* Standley. According to Fawcett & Rendle (*Fl. Jamaica 53:131*), the carpels of *P. paniculata* have sometimes a short weak spine at apex.

23. Synonyms: *P. racemosa* Sw., *P. scabra* (B. Vog.) Cif., non Presl.

24. Synonym: *P. spicata* var. *troyana* (Urban) Fawc. & Rend. Probably not more than a variety of *P. spicata*.

25. Known by only one collection (*Pringle 5447*). Schery (*Ann. Mo. Bot. Gard. 29:228*) suggested that this plant may be a hybrid between *P. Palmeri* and some species of *Malvaviscus*.

26. Synonyms: *Malvaviscus Palmeri* Baker f., *Pavonia amplifolia* Standley.

Pavonia Palmeri is very close to, if not identical with, *P. racemifera* of the adjacent state of Tepic. The description of the latter in Bot. Beechey's Voyage (p. 277) is too meager for a definite conclusion.

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TWO MALLOWES NEW TO CALIFORNIA. *Abutilon Palmeri* Gray, apparently not previously recorded as a member of the California flora, was collected in 1941 near Vallecito Station, San Diego County, at an elevation of 750 m. (*Frank F. Gander 9276*). The species is not uncommon in southwestern Arizona, northwestern Sonora, and Baja California.

Another species of *Malvaceae*, presumably new to California, is *Sida rhombifolia* L. It was growing as a weed in a cotton field in Madera County, where it was discovered by Farm Adviser Clarence E. Johnson, in 1952. The identification was made by Prof. John M. Tucker of the University of California College of Agriculture at Davis. This species is widely distributed in the tropical and subtropical parts of both hemispheres.

—T. H. KEARNEY.

LATHYRUS POLYPHYLLUS VAR. INSECUNDUS JEPSON. Recently Mr. John Thomas Howell called my attention to the fact that I had, for some unknown reason, overlooked the name *Lathyrus polyphyllus* var. *insecundus* Jepson (Man. Fl. Pl. Calif. 585,—1925) in "A revision of the North American species of *Lathyrus*" (Univ. Wash. Publ. Biol. 15:1—104,—1952).

Through the kindness of Dr. Rimo Bacigalupi, Curator of the Jepson Herbarium at the University of California, the type, collected by W. L. Jepson at Olema, Marin Co., California, on March 28, 1907, has been borrowed for study. The specimen, described by Jepson as having "Raceme not one-sided, the subulate calyx-lobes very prominent in bud," is rather copiously pubescent on stems and calyx and sparsely hairy on the leaflets. It has prominent lanceolate-acuminate lateral calyx-lobes that are very noticeably widened above their bases. In all these respects it is totally unlike *L. polyphyllus* Nutt. ex T. & G., but, as in all other characteristics it is referable to *L. vestitus* ssp. *puberulus* (White ex Greene) C. L. Hitchcock, op. cit. 18.

The type is very closely matched in the University of Washington Herbarium by a collection made by Michener and Bioletti in April, 1891, in the Oakland Hills.—C. Leo Hitchcock, University of Washington, Seattle.

NEW CALIFORNIA STATIONS FOR ISATIS TINCTORIA. The following account of Dyer's Woad from Tehama County, California, is taken from a recent letter from Beecher Crampton who has given me permission to publish his record here:

"I collected *Isatis tinctoria* along roadbank of highway U. S. 99, 5 miles north of Red Bluff, Tehama County (*B. Crampton 1204*). Supposedly this European weed is localized in Scott Valley, Siskiyou County, but it appears to be moving southward. Perhaps other collections have been made outside that area, but I thought you might be interested in its appearance beyond its range as reported for California."

In 1948, *I. tinctoria* was collected by H. M. Pollard on the Klamath River about 3 miles west of Orleans near the mouth of Camp Creek in Humboldt County. Mr. Pollard reports that the plant is not uncommon on sand- and gravel-bars for several miles along the Klamath River both above and below Orleans.
—J. T. HOWELL.

TRIFOLIUM GLOMERATUM IN TEXAS. On May 1, 1953, I received for identification two plants of an unfamiliar clover from Mr. W. L. Smith, Soil Conservation Service agent at Wills Point, Texas, with a note that they "may have been introduced with hop clover seed from Australia." The specimens were from a yellow hop planting in sandy soil 4 miles north of Fairfield, Freestone County, in east-central Texas. They proved to be *Trifolium glomeratum* L., a native of southern and western Europe, naturalized in South Australia, but not reported from the United States in any of the current regional manuals (Fernald's Gray, Gleason's Britton & Brown, Small, Abrams, or either flora by Rydberg). Doubtless the plant will appear again in this country. It is easily recognized by the small heads of rosy lavender flowers sessile in upper leaf axils.—Lloyd H. Shinnery, Southern Methodist University, Dallas, Texas.

ANTHEMIS FUSCATA BROT. IN SONOMA COUNTY, CALIFORNIA. This attractive annual chamomile first came to my attention when I identified a specimen for M. S. Baker, his No. 9505, collected May 18, 1940, along the Redwood Highway near Asti. On Mar. 23, 1952, it was found in the same place by P. A. Munz, his No. 17351. The plant, which is a native of the western Mediterranean region, was included by Mr. Baker in his 1941 (and later) mimeographed lists of Seed Plants of the North Coast Counties of California. I have seen no other report of the plant in North America.—J. T. HOWELL.

LATHYRUS SPHAERICUS IN CALIFORNIA. The Mediterranean region, whence comes the majority of our California weeds, has now contributed a distinctive new pea to our flora, *Lathyrus sphaericus* Retz. This annual, which differs from all others in the state in the bifoliolate leaves and in the solitary brick-red flowers borne on abbreviated peduncles, has recently been found abundantly naturalized on the south slope of Mt. St. Helena in Napa Co. by Peter H. Raven, his No. 2902. C. L. Hitchcock (Univ. Wash. Publ. Biol. 15:9,—1952) reports this species in the Pacific states only from western Oregon.—J. T. HOWELL.

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NEW
BOTANICAL
GARDEN

LEAFLETS
of
WESTERN BOTANY

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SAN FRANCISCO, CALIFORNIA
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BEITRÄGE ZUR KENNTNIS VON RUMEX XII:
SOME NEW AMERICAN SPECIES OF RUMEX

BY K. H. RECHINGER, FIL.

Vienna, Austria

Rumex tomentellus Rech. f., spec. nov. Certe perennis. Caulis verosimiliter elatus, stricte erectus. Tota planta imprimis ad petiolos et ad paginas inferiores foliorum indumento denso tomentello e papillis albidis in sicco hyalinis compressis composito tecta. Folia basalia petiolo crasso dimidia laminae longitudine brevior instructo; lamina in sicco crasse membranacea subcoriacea plana, e basi profunde cordata oblonga, in tertia circiter parte latissima inde apicem valde acutam versus sensim attenuata, 25–30 cm. longa, 7–11 cm. lata, subtus dense tomentella, supra papillis brevioribus laxius dispositis scabrida; nervi secundarii numerosi tenues, a costa mediana angulo fere recto abeuntes. Folia caulina ignota. Inflorescentia ad minimum 45 cm. longa, axi stricta vel subflexuosa, internodiis infirmis elongatis, ramis inferioribus fasciculatis elongatis superioribus singulis simplicibus tenuibus flaccidis erecto-patentibus, paniculam ineunte fructificatione laxiusculam subapertam formantibus. Florum glomeruli multiflori, inferiores et medii plus minusve remoti, superiores approximati; rami infimi tantum foliis diminutis breviter petiolatis e basi cuneata lineari-lanceolatis suffulti. Pedicelli ineunte fructificatione filiformes, prope basin vel in tertia circiter parte inferiore tenuiter articulati, ad basin perigonii subito valde saepe subangulato-incrassati, longitudine variabiles, perigonio immaturo sesqui- raro usque duplolongiores. Perigonii foliola exteriora lanceolata linearia acuta, marginibus inferiorum arcte appressa, plus minusve 2 mm. longa. Valvae in statu immaturo ovato-oblongae, basi rotundatae, apice acutiusculae vel obtusiusculae, integrae, nervo mediano saepe aliquantum longitudinaliter incrassato nec autem callifero, nervatura ceterum tenuiter reticulata.—Verosimiliter ad subsectionem *Aquatici* pertinet, indumento tomentello insignis; ceterum foliorum nervis numerosis subrectangularibus, pedicellis ad basin perigonii valde incrassatis, valvarum nervo mediano longitudinaliter subincrassato (nec autem callifero) memorabilis.

NEW MEXICO: 18 miles east of Mogollon on Willow Creek, 7640 feet elevation, Mogollon Mts., Catron Co., July 14, 1928, *G. B. Wolf 2640* (CAS, *typus*; BH *isotypus*).

More complete material of this interesting plant is urgently needed. Papillosity is a character which occurs, however much less pronounced than in this new species, only in two other species of the arctic-circumboreal subsect. *Aquatici*: *R. fenestratus* Greene subsp. *puberulus* Hultén in the eastern Pacific Coast district of Alaska and *R. aquaticus* L. subsp. *Schischkinii* Rech. f. in the Altai Mts. of Siberia.

Rumex nematopodus Rech. f., spec. nov. Radix verticalis perennis, caulem singulum proferrens. Caulis 85 cm. altus, stricte erectus, a tertia parte inferiore ramosus et fructifer, internodiis elongatis, tenuiter sulcato-striatus, brunnescens; panicula ramis tenuibus erectis plurimis singulis simplicibus angusta laxiuscula subaperta. Folia basalii petiolus $\frac{2}{3}$ laminae longitudinem aequans, 22 cm. longus, subcarnosus; lamina 34 cm. longa, 9 cm. lata, basi leviter cordata, plana, in sicco tenuiter membranacea flavescenti-viridis glabra laevis, nervis lateralibus numerosis tenuibus subrectis a costa mediana angulo circa 80° – 90° abeuntibus; lamina a basi usque ad $\frac{2}{3}$ superiores circiter aequilata, demum sensim attenuata, valde acuta. Folia caulina petiolo brevi latiusculo quartam usque quintam partem laminae latitudinis aequante suffulta; lamina in sicco crassiuscule membranacea sordide flavescenti-viridis, glabra laevis fere plana, e basi breviter saepe suboblique cuneata late linearilanceolata valde acuta; nervi laterales tenues numerosi, angulo 70° – 80° a costa mediana abeuntes; lamina folii caulini infimi 21 cm. longa, vix 3 cm. lata, a basi usque ad $\frac{2}{3}$ – $\frac{3}{4}$ longitudinis vix, deinde sensim attenuata; folia caulina superiora sensim decrescentia. Rami infimi tantum foliis diminutis suffulti. Florum glomeruli inferiores remoti, superiores contigui. Pedicelli tenuissime filiformes gracillimi prope basin tenuiter articulati, omnes valde elongati, sed longitudine variabiles, perigonio maturo 3 (–4)-plo longiores, ad basin perigonii abrupte saepe subangulato-incrassati. Perigonii foliola exteriora circa 1.5 mm. longa, lanceolato-linearia acuta dorso carinata basibus valvarum appressa. Valvae fructiferae 4–5 mm. longae, 3–4 mm. latae, ambitu ovato- vel subcordato-triangulares, basi truncatae vel leviter late cordatae, apice acutae, consistentia tenuiter membranacea, colore in statu submaturo olivascens, omnes ecallosae, tenuiter elevate reticulato-nervosae, margine indistincte subsinuato-denticulatae vel integrae. Nux submatura brunnea, circa 3 mm. longa et 1.5 mm. lata, vix infra medium latissima. — Inter species subsectionis *Aquatici* foliis angustis basi cuneatis, pedicellis longissimis perigonio 3 (–4)-plo longioribus, valvis parvis acutiusculis excellit.

ARIZONA: Huachuca Mts., 7000 ft., Sept. 4, 1903, *M. E. Jones* (DS, *typus*); Ramseys Canyon near Fort Huachuca, 9000 ft., Sept., 1882, *Lemmon 2879* (GH). *Phillips 3230* (CAS) and *Phillips & Kearney 3403* (CAS) from the White Mts., Apache County, mentioned in *Kearney and Peebles, Arizona Flora, 245* (1951), *sub R. occidentali*, possibly belong here, but they are very immature. The leaves are exceptionally long and narrow.

NEW MEXICO: White Mts., 6800 ft., Lincoln Co., July 31, 1897, *E. O. Wooton 624* (NY, US).

CHIHUAHUA, MEXICO: near Colonia Garcia in the Sierra Madre, 7400 ft., July 5, 1899, *Townsend & Barber 82* (NY, *sub R. salicifolio*).

X **Rumex pseudoorbiculatus** Rech. f., hybr. nov. (*R. obtusifolius* subsp. *agrestis* x *R. orbiculatus*.) Elatus erectus, infra inflorescentiam non ramosus. Folia caulina subcoriacea fere plana, lanceolata, prope basin latissima, apicem acutam versus longe sensim attenuata; nervi secundarii angulo circa 70° – 80°

a costa mediana abeuntes. Panicula sat ampla, e ramis arcuato-erectis simplicibus constituta, inferne paucifoliata, fructificatione manca laxiuscula. Pedicelli tenuiter filiformes longitudine variabiles, fructu usque plus quam duplo longiores. Valvae magnitudine et forma valde variabiles: aut ovato-oblongae aut late lingulatae aut late rotundato-cordatae; maiores callum elongato-fusififormem dimidia longitudine valvae longiorem ferentes; valvae minores subintegrae, maiores imprimis basin versus acute pluridentatae. Nuces plurimae steriles. — *R. orbiculato* Gray habitu, foliorum consistentia ac forma, valvis maioribus cordato-orbiculatis callis elongato-fusififormibus similis, ab eo autem valvis acute pluridentatis foliis basi magis dilatatis diversus. Evolutio irregularis valvarum et fructificatio manca originem hybrida plane indicat.

MASSACHUSETTS: brook, Purgatory Swip, Norwood, Aug. 3, 1895, *J. R. Churchill* (MO, *typus*).

The plant is similar to *R. orbiculatus* Gray. That it is a hybrid is proved by the very irregular development of valves and by the nuts usually being compressible and sterile. Only a species with toothed valves can be assumed as the other parent. There is hardly any doubt that this was *R. obtusifolius* subsp. *agrestis*, a weed of western European origin, well established for many years all over the United States, the more arid areas excepted.

Only very few natural hybrids by indigenous American species of *Rumex* are known, none of them between two American species. The only hybrid of *R. orbiculatus* known up to the present time is *R. crispus* x *R. orbiculatus* (syn., *R. Britannica* x *R. crispus*, Reching, Field Museum Bot. 17:147,—1937).

A NEW LEWISIA FROM NEVADA

BY ARTHUR H. HOLMGREN

Utah State Agricultural College, Logan

The high mountains of south-central Nevada have rewarded Dr. Bassett Maguire and me with several new species and hold much promise for future expeditions. Our brief survey of the Quinn Canyon Range in 1945 brought us a new *Lewisia* that has stimulated the writer to begin a study of this beautiful genus of plants.

KEY TO THE SPECIES OF LEWISIA SUBGENUS EULEWISIA

- Bracts linear-lanceolate, attenuate 1. *L. rediviva*
 Bracts ovate to ovate-oblong, obtuse.
 Flowers solitary; sepals 2 2. *L. disepala*
 Flowers cymose, usually 3 or 2, rarely only 1;
 sepals 3 or 4 3. *L. Maguirei*

1. *LEWISIA REDIVIVA* Pursh, Fl. Amer. Sept. 358 (1814).

1a. *LEWISIA REDIVIVA* subsp. *REDIVIVA*. *L. alba* Kellogg, Proc. Calif. Acad. 2:115 (1861).

Plant usually with linear, subterete leaves; sepals more than 15 mm. long; pedicels more than 1 cm. long.

Open rocky soil; British Columbia to California and east to Montana, Colorado and northern Arizona.

1b. *Lewisia rediviva* subsp. *minor* (Rydb.) Holmgren, comb. nov. *L. minor* Rydb., N. Amer. Fl. 21:327 (1932); *L. rediviva* var. *minor* (Rydb.) Munz, Man. South. Cal. Bot. 158, 598 (1935).

Plant with clavate leaves; sepals less than 15 mm. long; pedicels less than 1 cm. long.

Dry rocky ridges and exposed places; from Tooele County, Utah, and the Quinn Canyon Range, Nevada, to western Nevada and southern California.

2. *LEWISIA DISEPALA* Rydb., N. Amer. Fl. 21:328 (1932). *L. rediviva yosemitana* K. Brandeg., Proc. Calif. Acad. II. 4:89 (1894). Not *L. yosemitana* Jepson, 1923.

Known only on summits around Yosemite Valley, California (*J. T. Howell 15573*).

3. *Lewisia Maguirei* Holmgren, spec. nov. Perennis; radicibus pauciramosis; caudicibus brevibus crassis; foliis numerosis rosulatis, 1–2 cm. longis, 1.5–3.5 mm. latis, lineari-oblancoatis, obtusis, carnosis; scapis 1 vel pluribus, plerumque 1.5–2 cm. longis; cymis 3-floribus, raro 1- vel 2-floribus; bracteis 3, verticillatis, oblongo-ovatis, 3–5 mm. longis, 2.5–3.5 mm. latis, scariosis, subcarnosis ad basin; pedunculis articulatis, supra bracteas demum disarticulatis, cymis maturatis deciduis; pedicellis 3–9 mm. longis, singulis bractio scarioso 8–10 mm. longo suffultis; sepalis 3 vel 4, imbricatis, integris vel emarginatis, petaloideo-scariosis, 8–12 mm. longis, 4–8 mm. latis, late ovatis, basi latis, in unguem angustatis; petalis 7–9, albis vel roseis, oblanceolatis, obtusis, 8–12 mm. longis, 4–6 mm. latis; staminibus 7–9, filamentis circa 1 mm. longis, alatis, apice filiformibus; antheris circa 1 mm. longis, sagittatis; stylis 4–6, connatis subter; capsulis membranaceis, conico-oblongis, 7–10 mm. longis, basi circumscissis etiam dehiscentibus longitudinaliter; seminibus 5–8, aliquando 10, 1.5–2.5 mm. latis, laevibus.

Perennial from a fleshy, branched, taproot; caudex short, thick, bearing at its crown numerous rosulate leaves, the older ones marcescent and erect; herbage and inflorescence rose-suffused; leaves 1–2 cm. long, 1.5–3.5 mm. wide, linear-oblancoate, obtuse, fleshy, mid-rib prominent; scapes 1 to several, usually 1.5–2 cm. long, bearing a 3-flowered cyme, frequently 2 flowers present, rarely only 1; bracts 3, whorled, oblong-ovate, 3–5 mm. long, 2.5–3.5 mm. broad, completely scarious, subfleshy towards the base; the peduncle jointed and disarticulating immediately above the bracts, the complete cyme falling at maturity; pedicels 3–9 mm. long, each subtended by a linear-oblong, scarious bract 8–10 mm. long; sepals 3 or sometimes 4, entire or sometimes emarginate, petaloid-scarious, 8–12 mm. long, 8–14 mm. wide, broadly ovate, the base broad, narrowed into a very short claw, imbricate; petals 7–9, white to pinkish, oblanceolate, obtuse, 8–12 mm. long, 4–6

mm. wide; stamens 7-9, filaments about 1 cm. long, winged, filiform only below the anther, anthers about 1 mm. long, sagittate; styles 4-6, united below; capsule membranous, conic-oblong, 7-10 mm. long, circumscissile at the base, also dehiscent lengthwise; seeds usually fewer than 10, 1.5-2.5 mm. wide, smooth.

Type: *Maguire & Holmgren 25346*, the plants frequent in loose denuded soil derived from limestone, associated with pinyon, juniper, and sagebrush, on south facing ridge above Cherry Creek Summit, 7500 feet, Quinn Canyon Range, Nye County, Nevada, June 8, 1945 (New York Botanical Garden). Isotypes: Intermountain Herbarium, Logan, Utah; United States National Museum; University of California; California Academy of Sciences; Missouri Botanical Garden.

Cotype: *Maguire & Holmgren 25542*, the plants frequent on raw gravelly clay slope in open pinyon-juniper country, ridge north of Cherry Creek Pass, Quinn Canyon Range, Nye County, Nevada, June 20, 1945 (New York Botanical Garden and Intermountain Herbarium).

By virtue of the broad petaloid sepals and disarticulating peduncles, *L. Maguirei* belongs to the subgenus *Eulewisia*, as distinguished from the subgenus *Oreobroma* in which the sepals are not petaloid and the peduncles are not jointed. *Lewisia Maguirei* is most closely related to *L. disepala*. The characters which readily separate these species are featured in the above key.

A NEW MIMULUS FROM NEVADA

BY GABRIEL EDWIN

Beltsville, Maryland

Mimulus (subgen. SYMPLACUS, sect. SIMIOLUS) *brachystylis* Edwin, spec. nov. Folia ovata suborbiculata vel reniformi-orbiculata, usque ad 1.6 cm. longa, plerumque aequilata vel latiora, undulata, subintegra vel leviter irregulariterque dentata, folia inferiora longe petiolata subtus pilis brevibus albisque paucis, folia superiora subsessilia, suprema sessilia, plus minusque villosa; corolla vix exserta, usque ad 1.4 cm. longa, calycem paulo superans; stylus laevis, staminibus parvioribus multo brevior, vix 3-3.5 mm. longus; stigmata subaequalia peltata; fructus lanceolato-ovoideus, tubo calycis brevior.

Annual; stem glabrous, upright, simple or little branched from the base, four-angled, up to 22 cm. high; leaves ovate, suborbicular, or rotund with reniform bases up to 1.6 cm. long, mostly as broad or broader than long, undulate, subentire, or weakly and irregularly dentate, lower leaves long-petiolate with a few short white hairs below, upper subsessile, uppermost

sessile, more or less villous; pedicels longer below, shorter above than the subtending leaves and calyces; calyx up to 1.2 cm. long, 0.7 cm. wide, tinged with red, especially along the ribs, tube densely or lightly villous (occasionally glabrous), teeth short, obtuse, blunt, scarcely one-quarter as long as the tube; corolla narrow, exserted, up to 1.4 cm. long, little longer than the calyx, tube short, narrow, glabrous without, the throat almost completely closed by the hairy ridges (palate) within; stamens included, anthers glabrous or bearing a few cilia, filaments glabrous or rarely with a few short glandular hairs; style much shorter than the shorter pair of stamens, scarcely 3-3.5 mm. long, glabrous; stigmas subequal, peltate; fruit lanceolate-ovoid, shorter than the calyx-tube; seeds many, ovate, lightly reticulate, occasionally apiculate at one end or both ends.

Type: *Kay H. Beach & Laura E. Mills 881*, from moist loam around a spring on a steep north slope in Sunnyside Canyon about 5 miles north of Ione, 7000 feet elevation, Nye County, Nevada, July 14, 1930 (U. S. National Herbarium, Smithsonian Institution, Washington, D.C.).

Mimulus brachystylis is apparently most closely related to *M. guttatus* DC. but differs from the latter in the extremely short style, broader than long leaf, shorter blunter calyx-teeth, and narrower very little-exserted corolla.

U. S. National Arboretum Herbarium
Bureau of Plant Industry
Beltsville, Maryland

A TENTATIVE KEY TO THE NORTH AMERICAN SPECIES OF SIDA, L.

BY THOMAS H. KEARNEY

This is an artificial key and juxtaposition of the species does not always indicate close relationship. Many of the species are little known and in such cases the characterizations in the key have been drawn mainly from published descriptions. These are often vague and omit the characters upon which the divisions of the key are based. Whenever possible, however, examination of herbarium specimens has been the basis of the characterizations. "North America" is interpreted as including the West Indies and Panama. The notes will be found at the end of the paper. Note 1.

1. Leaves deeply palmately lobed, the lobes attenuate-acuminate, coarsely and irregularly serrate-dentate. Plants herbaceous, the herbage glab-

rate; flowers in long-peduncled corymbose or subracemose clusters, these forming an ample leafy panicle; petals white; carpels 10. Eastern United States *S. hermaphrodita* (L.) Rusby. Note 2

1. Leaves not lobed or obscurely so (2).
2. Plants arborescent, up to 8 m. high. Leaves long-petiolate, up to 15 cm. long, broadly ovate, truncate to cordate at base, subvelutinous (almost lepidote) on both surfaces with very minute, stellate hairs; inflorescences axillary, subpaniculate; calyx 10-14 mm. long; petals somewhat longer, yellow; carpels 5 or 6, short-cuspidate, pubescent. Virgin Islands, Culebra Island. *S. Eggersii* Baker f.
2. Plants herbaceous or shrubby, much smaller (3).
3. Peduncles adnate to the petiole of the subtending leaf or bract. Leaves sparingly serrate toward apex, mostly narrow, often wedge-shaped; flowers mostly in dense but few-flowered apical clusters, these as if involucrate by the upper leaves and the conspicuously hirsute-ciliate stipules; carpels 5-8, reticulate-rugose and muricate, rostrate or shortly aristate (4).
3. Peduncles not so adnate (6).
4. Leaves hirsute on both surfaces with very long, fine hairs; petals yellow. Stems diffusely branched from the base; leaves oblong, elliptic, or obovate; carpels spinose-muricate. Cuba *S. Brittoni* Leon
4. Leaves glabrous (rarely appressed-pubescent) above; petals commonly pink or purple (5).
5. Stems procumbent to ascending, diffusely branched from the base; leaves narrowly oblong to obovate or (rarely) suborbicular; petals 6-10 mm. long; carpels with usually short murications. Florida, Texas, Baja California, and West Indies to South America. *S. ciliaris* L. Note 3
5. Stems erect or ascending, sparingly branched; leaves linear; petals 10-15 mm. long; carpels with long, spinose murications. Texas to South America *S. anomala* St. Hil. Note 4
6. Involucel present, or the herbage silvery-lepidote, or the leaves wider than long. Flowers axillary, solitary or very few in the axils; carpels muticous or short-beaked: Section *Pseudo-Malvastrum*. Note 5 (7).
6. Involucel none; herbage not silvery-lepidote; leaves mostly longer than wide (10).
7. Plants herbaceous, the flowering stems from creeping rootstocks; leaves very asymmetric at base; flowers distinctly pedicelled, the pedicels often more or less flexuous and decurved; petals white or whitish; carpels 6-10 (8).
7. Plants suffrutescent; leaves (in *S. Helleri*?) not noticeably asymmetric; flowers subsessile; petals yellow or copper-colored; carpels normally 5. Involucel none; herbage stellate-tomentulose or -tomentose (9).
8. Herbage densely stellate-canescens; leaves wider than long, suborbicular or somewhat flabelliform, rounded at apex, rather regularly denticulate or dentate; involucel, of 1-3 subulate bractlets, usually present but very caducous; carpels indehiscent. Western United States, Revillagigedo Islands, northern Mexico. *S. hederacea* (Dougl.) Torr. Note 6
8. Herbage closely silvery-lepidote; leaves mostly longer than wide, acutish to acuminate at apex, often subhastately toothed or lobed at base

- (in var. *sagittaeifolia* A. Gray, Note 7); involucl rarely, if ever, present; carpels dehiscent at apex. Southwestern United States and northern Mexico *S. lepidota* A. Gray. Note 8
9. Leaves flabelliform, more or less cuneate at base; calyx not surpassing the fruit; carpels acuminate and becoming 2-beaked. Southern Texas *S. Grayana* I. D. Clement¹
9. Leaves suborbicular, rounded or truncate at base; calyx surpassing the fruit; carpels obtuse, apiculate. Southern Texas *S. Helleri* Rose
10. Calyx greatly accrescent, enclosing the fruit, membranous and veiny, the broad lobes overlapping. Plants herbaceous above ground; flowers solitary in the axils; petals yellow or whitish (11).
10. Calyx otherwise, only moderately accrescent (12).
11. Stems more or less decumbent from a long, tuber-like caudex, rather loosely pubescent with mostly few-rayed hairs; leaves symmetric or nearly so and usually subcordate at base, rounded to acutish at apex, oval, ovate, or suborbicular, coarsely crenate-dentate; calyx 10–15 mm. long, strongly plicate-angulate, the lobes deeply cordate; petals 12–20 mm. long; carpels 10–14, firm-walled, coarsely reticulate, with a long, horizontal beak, black at maturity. Texas to Arizona and northern Mexico; southern South America *S. physocalyx* A. Gray. Note 10
11. Stems procumbent or prostrate, often rooting at the nodes, very slender, minutely stellate and with long, simple hairs; leaves very asymmetric and cordate at base, acute or acuminate at apex, ovate, thin, shallowly dentate or crenate; calyx 5–7 mm. long at maturity, the lobes scarcely cordate; petals 6–7 mm. long; carpels 5, thin-walled, smooth or obscurely reticulate, muticous or nearly so. Southern Mexico to Panama; South America *S. decumbens* St. Hil. & Naud. Note 11
12. Inflorescences apical or subapical, corymbiform or short-racemose, the small subulate bracts caducous; leaves with entire margins, mostly linear or lanceolate, elongate, sharply attenuate-acuminate, short-petiolate or sessile. Stipules conspicuous, subulate, rather persistent; calyx campanulate, pilose or villous; petals white or whitish, often purple at base, 7–10 mm. long; carpels 7–9, muticous or nearly so, glabrous. Mexico and West Indies to South America *S. linifolia* Juss. Note 12
12. Inflorescences otherwise, or the leaves not entire (13).
13. Flowers closely subtended by several subulate or filiform, hispid or hirsute bracts (reduced leaves and stipules) much longer than the calyx, the flowers thus appearing involuclate. Herbage copiously hirsute with yellowish, stellate hairs; leaves oblong-lanceolate to narrowly ovate, crenate-serrate; flowers in dense axillary clusters and in leafy, spike-like, apical inflorescences, the individual flowers sessile; corolla yellow, slightly longer than the calyx; carpels 7–10, apiculate. Panama; northern South America *S. quinquevervia* Duchass. Note 13
13. Flowers not so subtended (14).
14. Flowers mostly in open (or sometimes thyrsoid) more or less leafy pan-

¹*Sida Grayana* I. D. Clement, nom. nov. *Sida cuneifolia* A. Gray, Bost. Jour. Nat. Hist. 6:165 (1850), non Roxb., 1832. Note 9.

icles, numerous or many, usually long-pedicellate. Petals less than 10 mm. long; carpels few (15).

14. Flowers not in many-flowered panicles, or, if so (in *S. micrantha* and occasionally in *S. aggregata*, *S. cordifolia*, and *S. urens*) then short-pedicellate and crowded, or if paniculate and long-pedicellate (sometimes so in *S. glabra*), then the flowers few and scattered (20).
15. Petals pink, purple, or dark red; glandular hairs none. Peduncles filiform (16).
15. Petals yellow or orange; glandular hairs present (except sometimes in *S. pyramidata*) (18).
16. Leaves narrowly lanceolate, cuneate at base, attenuate-acuminate at apex, serrate or serrulate, glabrous or glabrate above, up to 11 cm. long, the upper ones greatly reduced. Inflorescence-branches simply racemose; petals about 4 mm. long, pink or salmon-colored; carpels 5, obtuse, puberulent. Mexico (Sinaloa) *S. lodiensis* Baker f.
16. Leaves ovate or ovate-lanceolate, cordate or rounded at base. Flowers numerous, in very open panicles, the peduncles filiform, elongate (17).
17. Herbage sparsely to copiously stellate-pubescent; leaves crenate-dentate; petals 3-5 mm. long, dark red or dark purple, often reflexed; carpels 5, muticous to cuspidate, finely reticulate. West Indies, southern Texas, and Mexico to South America *S. paniculata* L. Note 14
17. Herbage glabrate; leaves sharply serrate; petals up to 8 mm. long, bright purple; carpels 6 or 7, muticous. Southern Mexico (Puebla)
 *S. tehuacana* Brandeg.
18. Carpels aristate, the awns slender, antrorsely pilose, much shorter than to nearly as long as the carpel-body. Herbage copiously glandular-pilose and with fewer long, spreading, simple hairs; inflorescence branches elongate, rather lax, the flowers rarely solitary in the axils, the pedicels short or elongate; leaves long-petiolate, ovate, cordate, finely dentate or crenate; calyx at maturity rounded at base; petals 5-8 mm. long; carpels 5. West Indies and Mexico to South America
 *S. glutinosa* Commers. Note 15
18. Carpels muticous to cuspidate. Leaves broadly ovate (19).
19. Inflorescence-branches mostly elongate and more or less racemose or subpaniculate, slender, not rigid; herbage sparsely to copiously stellate-puberulent, usually with few or no glandular or long, simple hairs; leaves long-petiolate, thin, green; calyx rounded at base, not angulate; carpels 5-8, thick, cuspidate to muticous, pilosulous, the firm lateral walls smooth. Plants suffruticose or shrubby; petals yellow or orange, sometimes red at base, 6-8 mm. long. Mexico and West Indies to northern South America . . . *S. pyramidata* Desportes. Note 16
19. Inflorescence-branches mostly short and corymbiform, rather stout and rigid; herbage tomentose and more or less glandular; leaves thickish, velutinous-canescens; calyx angulate; carpels 5, mucronulate, the thin lateral walls finely reticulate. Revillagigedo Islands
 *S. nesogena* Johnst. Note 17
20. Carpels 5 (21).
20. Carpels more than 5 (32).
21. Flowers very small, the petals 2-3 mm. long, not or barely surpassing the

- calyx; inflorescence an elongate, leafy thyrse with suberect, very many-flowered branchlets. Herbage rather roughly stellate-tomentose; leaves broadly ovate or suborbicular, cordate to truncate at base, up to 12 cm. long; calyx rounded at base, not angulate; petals yellowish or pink; carpels short-cuspidate (to muticous?), puberulent apically. Cuba and South America *S. micrantha* St. Hil. Note 18
21. Flowers larger, the petals slightly to considerably surpassing the calyx, or, if sometimes not surpassing it (in *S. alba*?, *S. jamaicensis*, *S. spinosa*, and *S. urens*) then the inflorescence not as in *S. micrantha* and the flowers much less numerous (22).
22. Pedicels very slender, usually elongate. Calyx more or less angulate-turbinate; petals yellowish to orange (23).
22. Pedicels relatively stout, usually very short, the flowers often subsessile (26).
23. Inflorescence, when well developed, forming an open, leafy, long-branched, relatively few-flowered panicle; stems erect to weak and sprawling; leaves up to 8 cm. long. Herbage glabrate to rather copiously pubescent with mostly simple, often somewhat glandular hairs; leaves rather long-petiolate, ovate or ovate-lanceolate, cordate at base, acuminate, crenate to serrate, thin, nearly concolorous; petals about 6 mm. long (24).
23. Inflorescence not paniculate, the flowers solitary in the axils; stems decumbent to prostrate; leaves seldom more than 2.5 cm. long. Carpels 3-4 mm. long, mucronate to aristate (25).
24. Carpels narrow, usually finely reticulate, pilose toward apex, with long or short, antrorsely pilosulous awns. Mexico and West Indies to northern South America *S. glabra* Mill. Note 19
24. Carpels round, smooth and nearly glabrous, truncate or merely apiculate at apex. Mexico (Chihuahua, Sonora, Morelos)
. *S. alamosana* Wats. Note 20
25. Stems creeping and often rooting at the nodes, hirsute or hirsutulous with mostly branched hairs, often very sparsely so; leaves orbicular or broadly ovate, deeply cordate, coarsely crenate; carpels opening irregularly below. West Indies *S. hederæfolia* Cav. Note 21
25. Stems decumbent to prostrate, seldom, if ever, rooting at the nodes, usually sparsely hirsute with long, simple hairs in addition to the short, stellate and glandular pubescence; leaves ovate to lanceolate, shallowly cordate or truncate at base, obtuse or rounded at apex, finely to rather coarsely crenate; carpels opening at apex. Calyx puberulent, usually also long-hirsute. Southern United States and West Indies to northern South America . . . *S. procumbens* Sw. Note 22
26. Leaves dorsiventrally distichous (in one plane). Herbage seldom conspicuously pubescent; stems erect or ascending; stipules conspicuous, persistent, up to 4 mm. wide, lanceolate, attenuate-acuminate, several-nerved, ciliate; leaves lanceolate, somewhat rhombic, rounded or cuneate at base, acutish to acuminate at apex, sharply serrate, short-petiolate or subsessile, the upper surface with rather long, appressed, simple hairs; flowers mostly in small, axillary glomerules, sessile or very shortly pedicellate; petals yellow or whitish, usually

- little surpassing the calyx; carpels muticous or apiculate, glabrous. West Indies and southern Mexico to South America.
 *S. glomerata* Commers. Note 23
26. Leaves not distichous or (in *S. jamaicensis*) obscurely so (27).
27. Flowers in dense, several-flowered, axillary and terminal glomerules or racemes, these sometimes constituting a leafy panicle. Leaves mostly long-petiolate, cordate; calyx angulate-turbinate in bud, hirsute or villous; carpels muticous or apiculate (28).
27. Flowers axillary, solitary or in few-flowered glomerules, the inflorescence not at all paniculate (29).
28. Stems herbaceous, hirsute with long, simple or few-armed spreading hairs; leaves ovate to lanceolate, usually considerably longer than wide, acuminate at apex, rather coarsely dentate or serrate, nearly concolorous, hirsute beneath with long, simple or few-armed hairs; petals 6-8 mm. long, about equaling the calyx; carpels 5, glabrous or nearly so. West Indies and southern Mexico to South America.
 *S. urens* L. Note 24
28. Stems somewhat woody, finely stellate-tomentose, with or without long, spreading, yellowish hairs; leaves broadly ovate, usually nearly as wide as long, cordate, obtuse to subacuminate at apex, denticulate or rather finely dentate, more or less discolorous, velutinous on both surfaces with short stellate hairs; petals (7) 10-12 mm. long, surpassing the calyx; carpels 5-7, puberulent, rounded-trigonous, muticous, lightly or obscurely reticulate. West Indies and Mexico to northern South America *S. aggregata* Presl. Note 25
29. Calyx with a broad, rounded base. Stems suffrutescent, these and the leaves and calyx densely pubescent with minute, stellate, yellowish hairs; leaves very shortly petiolate, the blades lanceolate, up to 6 cm. long, cuneate at base, acute, serrulate, thickish, 3-ribbed from the base and pinnately veined, the veins very prominent beneath; flowers axillary, solitary or loosely clustered on axillary branchlets, the peduncles 1 cm. long or less; calyx-lobes acute; petals yellow, about 4 mm. long, slightly longer than the calyx; carpels apiculate. Mexico (Sinaloa, Tepic) *S. stricta* Standl. Note 26
29. Calyx turbinate-angulate. Corolla (in *S. alba*?) little if any longer than the calyx (30).
30. Carpels opening irregularly below by a white membrane, shortly rostrate. Leaves roundish-ovate to lanceolate, subcordate to rounded at base, serrate, minutely stellate-pubescent, sometimes densely so beneath; flowers solitary in the axils but becoming racemously crowded at apex; peduncles much shorter than the subtending leaves; petals white or whitish. West Indies and (?) South America
 *S. alba* L. Note 27
30. Carpels opening regularly at apex, more or less aristate, the awns and apex of the carpel-body pilousulous with antrorse or spreading hairs. Leaves rounded, truncate or subcuneate (rarely obscurely cordate) at base (31).
31. Herbage finely soft-tomentose; stems herbaceous or somewhat woody, often decumbent, without infrapetiolear tubercles; leaves oblong or

- subrhombic to suborbicular, rounded or obtuse at apex, nearly concolorous; corolla whitish, buff, or pale yellow. West Indies and (?) southern Mexico to South America *S. jamaicensis* L. Note 28
31. Herbage minutely stellate-puberulent; stems herbaceous, erect, often with more or less spinose infrapetiolar tubercles; leaves ovate or oblong to (in var. *angustifolia* (Lam.) Griseb.) narrowly lanceolate, obtuse or acutish at apex, usually discolorous; corolla normally yellow. Central and southern United States and West Indies to South America *S. spinosa* L. Note 29
32. Corolla violet-purple. Stems woody, stellate-pubescent; leaves linear to oblong, mostly 3 or more times as long as wide; flowers solitary; peduncles slender, articulated toward apex, elongate (often surpassing the subtending leaves); carpels 7-10, prominently rugose-reticulate (33).
32. Corolla whitish to orange or pink, sometimes drying red (34).
33. Leaves discolorous, whitish-tomentose beneath, the upper ones subsessile; petals 4-5 mm. long; carpels apiculate or muticous. Texas and northeastern Mexico *S. filipes* A. Gray. Note 30
33. Leaves nearly concolorous, densely and finely stellate-pubescent on both surfaces, all distinctly petiolate; petals 8-12 mm. long; carpels short- aristate. Mexico (San Luis Potosí) *S. Palmeri* Baker f. Note 31
34. Leaves (in *S. turneroides*?) distichous (Note 32). Plants herbaceous or nearly so; herbage sparsely (rarely copiously) pubescent to nearly glabrous; flowers solitary in the axils or in few-flowered axillary and terminal clusters; petals (in *S. turneroides*?) yellow or whitish (35).
34. Leaves not distichous (36).
35. Stipules lanceolate or subulate, often falcate, conspicuous, persistent, prominently 3-nerved; leaves narrowly lanceolate to ovate, often somewhat rhombic; petals little surpassing to about twice as long as the calyx; carpels 7-12, more or less divaricately cuspidate or short- aristate (exceptionally nearly muticous). Southeastern U. S., Bermuda, West Indies, Mexico, and southward; Old World tropics. *S. acuta* Burm. Note 33
35. Stipules filiform; leaves narrowly oblong or oval-oblong; petals about twice as long as the calyx; carpels 7, aristate. Northeastern Mexico. *S. turneroides* Standl. Note 34
36. Corolla very small, little surpassing the calyx, the petals 5 (-7?) mm. long, pink with a dark basal spot (sometimes yellow when fresh?); flowers mostly in short-pedunculate, subumbellate or subracemose, few-flowered axillary clusters; plants shrubby or suffruticose. Herbage stellate-tomentose; leaves short-petiolate, ovate to lanceolate, often subrhombic, cuneate, rounded, or subcordate at base, obtuse to subacuminate at apex, rather finely crenate or dentate; calyx densely tomentose, the lobes acutish; carpels about 10, muticous or mucronulate, with thin, finely reticulate, lateral walls. West Indies and South America *S. acuminata* DC.
36. Corolla larger, or the petal color or inflorescence otherwise, or the plant herbaceous (37).
37. Stems prostrate; leaves less than 1 cm. long, ovate, serrate, discolorous.

- Calyx angulate, the lobes acuminate; petals yellow; carpels 6, mucous. West Indies (Isle of Pines) *S. nummularia* Baker f. Note 35
37. Stems normally erect or ascending; leaves mostly larger (38).
38. Carpels normally long-aristate and the awns retrorsely hispid; leaves not rhombic. Stems usually herbaceous, occasionally with long, spreading, simple hairs in addition to other pubescence (39).
38. Carpels (unknown in *S. corymbosa*) not long-aristate or if sometimes so (in *S. rhombifolia*) then the awns not retrorsely hispid and the leaves usually more or less rhombic (41).
39. Herbage minutely canescent; leaves mostly linear or narrowly oblong (the lowest sometimes ovate), rounded or subcuneate at the narrow base, denticulate or serrulate; inflorescence of solitary or binate axillary flowers, these somewhat crowded and subracemose at apex of the stem and branches; calyx 5-6 mm. long, not noticeably plicate, the lobes not subcordate; petals whitish or cream-colored, brownish at base, sometimes with pink veins, little if any longer than the calyx; carpels 6-8 (10), narrow, conspicuously muricate. West Indies and Mexico to northern South America. *S. salviaefolia* Presl. Note 36
39. Herbage velutinous, often rather loosely so, the hairs fine and rather long; leaves oblong-ovate to broadly ovate or suborbicular, cordate or truncate at the broad base, dentate or serrate; inflorescence more or less paniculate, usually many-flowered, the flowers mostly corymbosely or subracemosely crowded on the branchlets; calyx 6-8 mm. long, plicate-angulate, the lobes broad, subcordate; petals yellow or yellowish; carpels 7-12, rather broad at base, prominently reticulate but seldom muricate, the awns often surpassing the calyx but occasionally short and with non-retrorse hairs (40).
40. Petals up to 10 mm. long, little if any surpassing the calyx, not spotted. Florida, Texas, West Indies, and Mexico to South America
 *S. cordifolia* L. Note 37
40. Petals up to 14 mm. long, much surpassing the calyx, with a red basal spot. Hispaniola and (?) Cuba. *S. maculata* Cav. Note 38
41. Peduncles usually equaling or surpassing the subtending leaves, these often much reduced in the inflorescence; flowers solitary in the axils; leaves not rhombic. Carpels about 10 (42).
41. Peduncles shorter (usually much shorter) than the subtending leaves, except occasionally in *S. rhombifolia*, *S. tragiaefolia*, and *S. Elliottii* (45).
42. Leaves (at least the lower ones) ovate to broadly lanceolate, crenate or crenate-serrate (43).
42. Leaves all linear-lanceolate or narrowly oblanceolate, crenulate or serrulate. Petals yellow or orange, 12-14 mm. long (44).
43. Inflorescence appearing racemose because of the great reduction of the upper leaves; herbage more or less glandular; lower leaves prevailingly ovate- or oblong-lanceolate, up to 10 cm. long; peduncles up to 5 cm. long; petals white or salmon-colored, 15-25 mm. long. Baja California and Sinaloa *S. Xanti* A. Gray
43. Inflorescence not at all racemose, the flowers few, solitary in the upper axils; herbage not glandular; leaves all ovate or oval, up to 4 cm. long,

- the upper ones not greatly reduced; peduncles up to 10 cm. long; petals yellow, about 7 mm. long. Mexico (San Luis Potosí)
 *S. potosina* Brandeg.
44. Peduncles up to 5 cm. long, articulated considerably below the apex; carpels cuspidate, puberulent or glabrate, prominently rugose-reticulate. Louisiana and Texas to Guatemala
 *S. Lindheimeri* Engelm. & Gray. Note 39
44. Peduncles 7.5–15 cm. long, articulated near apex; carpels muticous, glabrous. Western Texas, northeastern Mexico, and (?) New Mexico
 *S. longipes* A. Gray
45. Plants more or less woody (46).
45. Plants (except sometimes in *S. rhombifolia* and *S. tragiaefolia*) herbaceous above the caudex (51).
46. Flowers in dense, several-flowered, axillary and terminal glomerules or racemes, these sometimes constituting a leafy panicle, the peduncles shorter than the flowers; carpels 5–7. (For other characters see second paragraph 28.) West Indies and Mexico to northern South America
 *S. aggregata* Presl
46. Flowers solitary or geminate in the axils, often more or less aggregated at apex of the stem and branches; carpels seldom fewer than 8 (47).
47. Carpels 7 or 8. Stipules long-ciliate; leaves narrowly oblong or lanceolate-oblong, rounded at base, dentate above the middle, green and sparsely pubescent with long, appressed, simple hairs above, paler and copiously stellate-pilose beneath; calyx turbinate, 10-nerved, the nerves thickened at base, the lobes long-acuminate; corolla about equaling the calyx; mature fruit unknown. Mexico (Tepic to Vera Cruz)
 *S. corymbosa* R. E. Fries. Note 40
47. Carpels (8) 10–12 (48).
48. Leaves broadly oval or oblong-oval, obtuse or subcuneate at base, sparsely pilose on both surfaces; carpels subacute, about 2.5 mm. long. Calyx about 7 mm. long, the lobes acuminate; petals about 11 mm. long, yellow, fading pink. Mexico (Michoacan)
 *S. Woronovii* Ulbr. Note 41
48. Leaves lanceolate or oblong-lanceolate to ovate-oblong; carpels shortly beaked or aristate (49).
49. Upper and lower leaf-surfaces soft-pubescent. Leaves serrate, rounded or subcordate at base; calyx about 6 mm. long, the lobes acute or sub-acuminate; petals longer than the calyx; carpels 10–12, cornute, reticulate laterally. Central America (El Salvador)
 *S. Barclayi* Baker f. Note 42
49. Upper leaf-surface glabrous or glabrescent (50).
50. Calyx 5–8 mm. long, the lobes acute or short-acuminate; carpels with subapical awns up to 1.5 mm. long, thin-walled, reticulate. Plant suffruticose; corolla 11–12 mm. long, white or pale reddish-yellow. West Indies (Cuba, Jamaica, Leeward Islands, Trinidad)
 *S. antillensis* Urban. Note 43
50. Calyx 3–3.5 mm. long, the lobes subulate-acuminate; carpels with beaks 0.5 mm. long. Corolla unknown. Jamaica. *S. troyana* Urban. Note 44
51. Leaves normally more or less rhombic and cuneate at base, lanceolate to

ovate or obovate, finely serrate, discolorous, short-petiolate. Plants herbaceous or suffrutescent, rarely shrubby; herbage and calyx finely stellate-pubescent or glabrate; stipules more or less persistent; flowers axillary, solitary or more or less aggregated at ends of the branchlets, the peduncles much shorter than to nearly equaling the leaves; petals somewhat longer than the calyx, yellow or whitish, sometimes purplish at base; carpels mostly 10-14, nearly muticous to long-aristate with glabrous or antrorsely pilosulous awns. Southern United States to Arizona (introduced in California) and West Indies to South America; Old World tropics *S. rhombifolia* L. Note 45

51. Leaves not rhombic or cuneate, serrate or crenate. Species difficult to distinguish (52).
52. Upper leaves often greatly reduced and the inflorescence appearing elongate-racemose; peduncles often longer than the subtending leaves; leaves prevailing ovate or oblong-lanceolate, truncate or subcordate at base, crenate or crenate-serrate, often coarsely so; plant often suffrutescent. Calyx puberulent to villous; petals orange or yellow, 10-15 mm. long. Southern Texas, southern Arizona, and northern Mexico. *S. tragiaefolia* A. Gray. Note 46
52. Upper leaves usually not greatly reduced; peduncles shorter (usually much shorter) than the subtending leaves; leaves narrower, rounded or subcuneate at base, finely serrate or serrulate; plants herbaceous (53).
53. Flowers relatively large, the petals about 15 mm. long (54).
53. Flowers mostly smaller, the petals usually less than 15 mm. long (55).
54. Calyx finely pubescent; leaves oblong-lanceolate, elliptic, or narrowly obovate; petals orange; carpels usually aristate. Seeds pubescent at the hilum. Florida *S. rubromarginata* Nash. Note 47
54. Calyx usually more or less villous-hirsute at base; leaves lanceolate or linear-oblong; petals yellowish; carpels more or less bidentate, strongly incurved. Southeastern Virginia. *S. inflexa* Fern. Note 48
55. Stems several or numerous, low (exceptionally 75 cm. long), spreading or ascending from a woody caudex (or rootstock?); petals drying pink (orange when fresh?). Flowers mostly in few-flowered terminal clusters; leaves linear-lanceolate or the lower ones oblong or elliptic, the upper leaves not greatly reduced; stipules conspicuous, persistent. Western Texas to southern Arizona and Mexico. *S. neomexicana* A. Gray
55. Stems few, more erect; petals yellow or orange (56).
56. Leaf-blades narrowly linear, these and the calyx-lobes often red-margined; pedicels often much longer than the calyx; stems up to 50 cm. long; carpels (always?) cuspidate or shortly aristate. Southeastern U. S. *S. Elliottii* Torr. & Gray. Note 49
56. Leaf-blades linear-lanceolate, oblanceolate, or the lowest elliptic, these and the calyx-lobes not red-margined; pedicels not longer than calyx; stems up to 130 cm. long; carpels rounded at apex, mucronate to nearly muticous. Southeastern U. S. *S. leptophylla* Small

NOTES

1. The following species (?), some of which may not belong to the genus *Sida* as now restricted, have not been identified: *S. amatlensis* Sessé & Moç. (Mexico), *S. Anoda* Sessé & Moç. (Mexico), *S. bicallosa* Raf. (U. S. A.), *S. bicolor* Cav. (Mexico), *S. brachystemon* DC. (Mexico), *S. cardanisea* Raf. (U.S.A.), *S. coerulea* Sessé & Moç. (Mexico), *S. collina* Schlecht. (Mexico), *S. conferta* Sessé & Moç. (Puerto Rico), *S. costata* Schlecht. (Mexico), *S. deflexa* Cav. (Cuba), *S. gracilis* Rich. non Ell. (West Indies), *S. hastifolia* Sessé & Moç. (Mexico), *S. hermanniaefolia* Willd. (Mexico), *S. hibisciformis* Bertol. (Guatemala), *S. integrifolia* Sessé & Moç. (Cuba, Mexico), *S. Kunthiana* Presl (Mexico), *S. mexicana* Scop. (Mexico), *S. parviflora* Sessé & Moç non Willd. (Cuba), *S. repens* Sessé & Moç. (Cuba), *S. Schmitzii* Turcz. (Mexico), *S. triloba* Sessé & Moç. (Mexico).

2. Synonym: *S. Napaea* Cav.

3. Synonyms: *S. erosa* Salzm., *S. fulva* St. Hil., *S. muricata* Cav.; and perhaps *S. plumosa* Cav. and *S. tridentata* Cav. Three varieties are distinguished in Fl. Bras. (123:284, 285).

4. Synonyms: *S. fasciculata* Torr. & Gray non Willd., *S. anomala* var. *mexicana* Moric. (a very narrow-leaved form with leaves dentate only at apex), *S. ciliaris* var. *anomala* (St. Hil.) Hochr., *S. ciliaris* var. *mexicana* (Moric.) Shinners.—Intergrades, apparently, with *S. ciliaris*.

5. A heterogeneous and poorly defined section.

6. Synonyms: *S. leprosa* var. *hederacea* K. Schum., *S. obliqua* Nutt. The involucre-bractlets are attached slightly below (or sometimes on?) the calyx-tube.

7. Synonym: *S. sagittifolia* (A. Gray) Cory.

8. Possibly hybridizes with *S. hederacea*.

9. Dr. Clement has kindly given permission to publish this new name.

10. Synonym: *S. hastata* St. Hil., non Willd. R. E. Fries (Sv. Vet. Akad. Handl. ser. 2, 42(12):35) distinguished two varieties (as of *S. hastata*), var. *glabriuscula* in North America and var. *tomentosa* in South America.

11. Synonyms: *S. stolonifera* Salzm. ex Turcz., *Anoda decumbens* Hochr. Because of the hyaline lateral walls of the carpels, Hochreutiner transferred this species to *Anoda*, but it was retained in *Sida* by Rodrigo and by Monteiro f.

12. Synonyms: *S. angustissima* Miq., *S. campi* Vell., *S. longifolia* Brandeg., *S. viminea* Fisch.

13. Synonyms: *Sida guianensis* K. Schum., *Sidastrum quinquenervium* Baker f.

14. Synonyms: *S. alpestris* St. Hil., *S. atrosanguinea* Jacq., *S. capillaris* Cav., *S. floribunda* H.B.K., *S. Humboldtii* D. Dietr., etc.

15. Synonyms: *S. Endlicheriana* Presl, *S. insperata* Standl. & Williams, *S. nervosa* DC., and *S. pannosa* Turcz.

16. Synonyms: *S. dumosa* Sw., *S. cinerea* Baker f., *S. glanduligera* Benth., *S. leiophylla* Spreng.; and perhaps *S. Hilariana* Presl.

17. Johnston compared this species with *S. glutinosa*, *S. glabra*, and *S. alamosana*, but it seems quite distinct from any of these.

18. Synonyms: *S. buettneriacea* Klotzsch, *S. phlebococca* Griseb.

19. Synonyms: *S. arguta* Sw., *S. ulmifolia* Cav.; and perhaps *S. verruculata*

DC.—*S. glabra* var. *setifera* Helwig from Hispaniola has the stems and petioles copiously hirsute with very long (up to 3 mm.), very fine hairs, and awns about as long as the body of the carpel.

20. Very similar, except in the remarkably different carpels, to *S. glabra*, of which it was cited as a synonym by Standley (Trees & Shrubs Mexico, p. 767).

21. Perhaps not specifically distinct from *S. veronicaefolia* Lam. It is *S. veronicifolia* var. *hederifolia* K. Schum. Synonym (?): *S. humilis* Cav. (See Jennings, Ann. Carnegie Museum 11:179).

22. Synonyms: *S. diffusa* H.B.K., *S. filicaulis* Torr. & Gray, *S. filiformis* Moric. non Jacq., *S. ovata* Cav., *S. pilosa* Cav., *S. supina* L'Her.; and perhaps *S. caespitosa* Helwig.—*Sida filiformis* is a narrow-leaved form with no long hairs on the stems.

23. Synonym: *S. mollis* Rich. non Ortega. Mexican specimens previously identified as *S. glomerata* were referred by Standley (Trees & Shrubs Mexico, p. 766) to *S. corymbosa* R. E. Fries, with 7 or 8 carpels.

24. Synonyms: *S. breviflora* Steud., *S. debilis* G. Don, *S. sessiliflora* G. Don non D. Dietr., *S. verticillata* Cav.

25. Synonyms: *S. savannarum* K. Schum., *S. ampla* M. E. Jones; and perhaps *S. arguta* Presl non Sw. and *S. setifera* Presl.

26. This very distinct species superficially resembles narrow-leaved forms of *Sphaeralcea angustifolia*.

27. Characters from Fl. Jamaica 5(3):114. *S. alba* is given as a synonym of *S. spinosa* by Baker f. and in Fl. Bras. This species (?) is inadequately known.

28. Synonyms: *S. alnifolia* Presl non L. (fide Fl. Jamaica), *S. hermannioides* H. B. K., *S. tristis* Schlecht.

29. Synonyms: *S. alnifolia* L., *S. angustifolia* Lam., *S. heterocarpa* Engelm., *S. hyssopifolia* Presl, *S. linearis* Cav., *S. minor* Macf., *S. pusilla* Cav., *S. tenuicaulis* Hook. f.; and perhaps *S. subdistans* St. Hil. & Naud.

30. Synonym (?): *S. venusta* Schlecht., an older name.

31. Synonym: *Sphaeralcea* ? *fruticosa* Brandeg. In publishing this species Brandege questioned its position in *Sphaeralcea*.

32. This, in *S. acuta*, usually apparent even in dried specimens.

33. Synonyms: *S. Berlandieri* Turcz., *S. carpinifolia* L. f., *S. frutescens* Cav., *S. Garckeana* Polak., *S. glabra* Nutt. non Mill., *S. jamaicensis* Vell. non L., *S. obtusa* A. Rich. non Cav., *S. planicaulis* Cav., *S. stipulata* Cav., *S. trivialis* Macf., *S. ulmifolia* Mill., etc.

34. Perhaps not specifically distinct from *S. acuta*. Leaves "probably distichous" fide Standley (Field Mus. Bot. Ser. 22:90).

35. Although Baker gave the number of carpels as 6, it cannot be determined from his brief description whether *S. nummularia* is distinct from *S. procumbens* Sw. (Compare second paragraph 25.)

36. Synonyms: *S. Holwayi* Baker f. & Rose, *S. erecta* Macf., *S. angustissima* St. Hil. var. *Mortiziana* K. Schum., *S. spinosa* L. var. *salviaefolia* (Presl) Baker f.

37. Synonyms: *S. althaeifolia* Sw., *S. hamulosa* Salzm., *S. herbacea* Cav., *S. micans* Cav., *S. pellita* H.B.K., *S. portoricensis* Spreng., *S. pungens* H.B.K., *S. rotundifolia* Lam., *S. suberosa* L'Her., *S. truncata* Cav., etc. In var. *althaeifolia* (Sw.) Griseb., the carpels are short-awned to nearly muticous.

38. Usually cited as a synonym of *S. cordifolia* but Urban (Symb. Antill. 8:417) recognized it as a species, although he mentioned no distinguishing characters.

39. Synonyms: *S. Elliottii* var. *texana* Torr. & Gray, *S. texana* Small. Seems very close to *S. Elliottii* (first paragraphs 56) except in its longer peduncles.

40. Synonym: *S. glomerata* Hemsl. non Cav. Leaves described by Fries as spirally disposed. See also *S. glomerata*, first paragraph 26.

41. Perhaps not specifically distinct from *S. rhombifolia*.

42. Doubtfully distinct from *S. rhombifolia*.

43. Considered by Urban (Symb. Ant. 5:418) to be intermediate between *S. rhombifolia* and *S. spinosa* but if *Broadway 2593* from Trinidad (U. S. Nat. Herb. 1047692) is typical of *S. antillensis* it is distinct from either of those species. It is certainly not *S. carpinifolia* (*S. acuta*) to which it was reduced by Britton & Wilson (Sci. Surv. Porto Rico and Virgin Islands 5:552).

44. "Perhaps a depauperate form of *S. rhombifolia*" (Fl. Jamaica 53:120).

45. Synonyms: *S. alba* Cav. non L., *S. canariensis* Willd., *S. hondensis* H.B.K., *S. rhomboidea* Roxb., *S. ruderata* Macf., *S. scoparia* Vell., *S. surinamensis* Miq., *S. trinervia* Splitg.; and perhaps *S. callifera* Griseb., *S. Haenkeana* Presl, and *S. Kohautiana* Presl.

46. Apparently rather closely related to *S. Xanti* (first paragraph 43).

47. The seed-character was pointed out by Hochreutiner (Ann. Genève 6:35) who stated that in the related *S. Elliottii* the seeds are completely glabrous. Seeds not described for *S. inflexa* and *S. leptophylla*.

48. The calyx in *Fernald & Long 11372*, cited by Fernald in his description of this species (Rhodora 42:463-465), is not as characterized in the key. It is so, however in *Fernald & Long 11077*.

49. Synonym: *S. gracilis* Ell. non Rich.

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NEW WEEDS FOR THE SIERRA NEVADA, CALIFORNIA. On May 9, 1953, while traveling along the Oroville road 3.3 miles from Bangor, Butte County, I noticed along the roadside in the oak woodland what appeared to be an erect clover with bright strawberry-red corollas. Upon further examination, it has proved to be *Trifolium incarnatum* L., a native of middle and southern Europe. While this striking clover has been reported from northern California a few times previously (e.g., Weeds of California, 1951 ed., p. 268), this is probably the first record for the Sierra Nevada, my No. 5458. It is occasionally utilized as a forage crop in the northern Sacramento Valley.

But this was not the only unusual clover at this station. Some plants a short distance removed have since proved to be *Trifolium hirtum* All. (5456). This interesting annual is a native of the Mediterranean region of Europe and North Africa. It may be distinguished from the other Californian species of *Trifolium* by the conspicuous involucre, the 20-nerved villous calyx, the elongate purplish banner, and the linear appendages of the stipules. The remarkable involucre, which is penciled with pink and purple, is formed by the expanded stipules and leaf-bases of the uppermost leaves. While this clover has not yet been reported from western North America, Fernald (Gray's Manual of Botany, ed. 8, 1950, p. 893) and others record it as a weed in Virginia. It may turn up elsewhere in the United States, the plants growing from seeds imported from Europe as mixtures in commercial clover seed.

In a nearby stream bed grew the rarely reported rubiaceous weed, *Crucianella angustifolia* L. (5442A), growing with *Hedypnois cretica* (L.) Willd. (5452) and *Dianthus prolifer* L. (5460). The *Crucianella* was observed to be fairly common in the oak belt of Butte and Yuba counties. This is the second collection I know of from California. The first was collected on the west side of the Sacramento Valley by A. A. Beetle in 1944 on dry hills near Igo, Shasta County. This collection was reported (Leafl. West. Bot. 4:64) as from Tehama County. This plant is also a native of the Mediterranean region of Europe and North Africa.

And so a natural-appearing hillside in Butte County yielded several interesting weeds.—Peter H. Raven.

LINARIA DALMATICA IN THE PACIFIC STATES. The showy Dalmatian toadflax, *Linaria dalmatica* (L.) Miller, has escaped from cultivation and may be reported in California, Oregon, and Washington as shown by the following records in Herb. Calif. Acad. Sci.

CALIFORNIA: Vista, San Diego Co., *Munz 15571* in 1938; Saticoy, Ventura Co., *Holmer in 1952*.

OREGON: Burns, Harney Co., *J. T. Howell 28660* in 1952; 4 miles south of Condon, Gilliam Co., *Cronquist 6713* in 1950; garden escape in empty lot, Klamath Falls, Klamath Co., *M. S. Baker 11459* in 1946; dry roadside, Brothers, Deschutes Co., *Peck 25841* in 1949.

WASHINGTON: east of Easton, Kittitas Co., *Ricker 6319* in 1946. In 1952, I saw the plant along the highway between Davenport and Spokane but I made no collection.

The species has recently been reported from Flagstaff, Arizona, where it is also an escape from cultivation (Leaflet West. Bot. 7:6).—JOHN THOMAS HOWELL.

CONCERNING THE AUTHORSHIP OF ANTENNARIA ROSEA. For a number of years I have attributed the name *Antennaria rosea* to "(D. C. Eat.) Greene," but in a recent letter, Dr. Arthur Cronquist of the New York Botanical Garden tells me why I have been wrong. He gives me permission to publish the following:

"My attribution of *Antennaria rosea* to Greene rather than to (D. C. Eaton) Greene was intentional and I think entirely legal. *Antennaria dioica* var. *rosea* D. C. Eaton (1871) was a nomen nudum, not validly published, as was also *A. parvifolia* var. *rosea* Greene (Pitt. 3:175, 281—1897). Since the Rules state that names which are not validly published 'have no status under the Rules, and no claim to recognition by botanists,' these names should not be referred to in the author-citation. So far as I am aware, the first valid publication of the epithet *rosea* for the plant in question is that given by Greene in *Pittonia* 3:281 (1898), where he used the binomial, *Antennaria rosea*. The technically proper citation of the name is thus *A. rosea* Greene, not *A. rosea* (D. C. Eaton) Greene."—J. T. HOWELL.

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"I REMEMBER, WHEN I THINK . . ."

BY JOHN THOMAS HOWELL

It was early in 1924 when I first saw Miss Eastwood. At the time, I was on a field trip of the Calypso Club, the students' botanical club at the University of California, and a group of us were on our way from Mill Valley to the north side of Mt. Tamalpais under the leadership of Herbert Mason. When we were about to pass the gate marked "Eastwood" on the upper part of Summit Avenue, Herbert suggested that we stop and say "Good morning" to the head of the Botany Department of the California Academy of Sciences, if she was at home. She was, and welcomed us into her garden. There she showed us the unusual exotics and rare Californians she had brought together, and told us about them with that enthusiasm for plants which over the years attracted so many plant-lovers to her.

How well I remember that morning at the Eastwood place above Mill Valley! A beginner in Botany, I trailed along after Miss Eastwood and Herbert, in awed admiration at the learned remarks that passed between them. Little did we suspect then that five years later fire would sweep down the chaparral-covered slopes of Mt. Tamalpais, leaving the Eastwood place in ashes; nor did we foresee that in May of that same year, 1929, I would begin work at the Academy under Miss Eastwood.

My first strictly botanical visit to the Academy was in the fall of 1926, after I had begun work in *Lessingia* under Dr. Willis Linn Jepson as partial fulfillment of requirements for a master's degree at the university. There in the Academy's flower-show, then as now displayed in the foyer of the North American Hall, were the first living specimens I ever saw of *L. germanorum*. I hurried up to the herbarium to introduce myself and my problem to Miss Eastwood and to inquire the place where the *Lessingia* had been found. She told me she had picked it that very morning from the sand hill just east of St. Ignatius College (now the University of San Francisco) where she had spotted them from a McAllister Street trolley when on her way to the Academy.

She took a real interest in my problem and spared no trouble to make that first and subsequent visits to the Academy herbarium pleasant and profitable. Dr. Jepson, in a remote sort of

way, was probably just as keenly interested, but he did not seem to have the same personal regard for my problems. His distant supervision of my work, it is true, promoted self-reliance and initiative, but precluded any sociable intercourse that would have made study under him more pleasurable. Is it any wonder then that later, whenever I revisited the Bay region from my first botanical positions at the University of California in Los Angeles or at the Rancho Santa Ana Botanic Garden, I visited the Academy as faithfully as I did my *alma mater*. And it was natural that, on the termination of my work at the Rancho Santa Ana, I should turn to the Academy for employment since, at the time, there was none to be had in Berkeley.

It is interesting to compare Miss Eastwood and Dr. Jepson, since both have had so great an influence on California Botany over approximately the same period of years. As a student under Jepson, I gave him the adulation of a hero-worshiper, though now I wonder how I could have been quite so extravagant with so reserved a person. I still think that Jepson's magnetic personality attracted me, but undoubtedly it was my love of plants and desire to learn about them that exalted, in my mind, the person who knew so much. I was like one starved and waiting for food, and was filled with gratitude when the master let fall a crust of knowledge or a crumb of wisdom. With Miss Eastwood, nothing of knowledge or wisdom was reserved—her table was a veritable feast spread out for any who wished to sample or to partake deeply. Only an intimate few came to know Jepson (I count myself fortunate to have been among them); but anyone with a sincere love of flowers or beauty could have known Miss Eastwood.

I believe a reason for Jepson's reserve and Miss Eastwood's openness is to be sought in their different approaches to truth. Both wished to arrive at a true exposition of the plants they studied: Jepson, after prolonged deliberation, strove to arrive without making a mistake; Miss Eastwood was much more hasty and did not fear to express almost precipitately what she was convinced of at the time. On a field trip, Jepson would rarely express his opinion on a critical species; Miss Eastwood was most expressive on a trip, giving names to the most puzzling plants or making remarks about them. Fear of making a mistake was undoubtedly a causative factor in Jepson's reserve; freedom from fear was part of Alice Eastwood's strength.

The Jepson and Eastwood concepts of species were so far apart that the two botanists could never have been close scientifically — he conservative, with a broad concept reminiscent of George Bentham, Asa Gray, and Joseph Dalton Hooker; she sympathetic with the proposals and outlook of Edward Lee Greene. Jepson would never accept any plant as a species unless he was persuaded that it was a good species and, since he disagreed with Miss Eastwood's view of specific limits, he either ignored or reduced most of her specific proposals. Miss Eastwood, on the other hand, would never discard another botanist's proposal until she was persuaded it was not good, so hesitant was she of wronging the opinion of a fellow-worker. Miss Eastwood would maintain a species until it was proved false; Dr. Jepson would accept no species until it was proved good: Miss Eastwood's approach to plants was essentially analytic; Jepson's approach, conditioned by his life-work on his Flora of California, was definitely synthetic. Miss Eastwood's power of observation and discernment of differences were greater; Jepson's ability to evaluate characters and delineate a hierarchy of taxa was outstanding. Small definite differences would delimit an Eastwood taxon, and with Miss Eastwood, most delimitable entities were proposed as species. That so many of her proposals are proving of critical interest to students with training in genetics attests the keen discrimination Miss Eastwood has shown. Miss Eastwood could never have written a manual on California plants; Jepson could never have plumbed the taxonomic depths of California *Arctostaphylos*.

Among their friends and acquaintances, Miss Eastwood and Dr. Jepson were not always cordial in their remarks about each other, but that is understandable when one recalls how divergent were their botanical opinions. Dr. Jepson never directly disclosed to me his real feelings when I accepted a position under Miss Eastwood at the Academy, but from friends who were working in his laboratory, I learned that he declared that I had deserted to "the camp of the enemy!" (It was at that time I had to relinquish my position as Secretary of the California Botanical Society, of which he was still president, and it was several years before I could pay my respects personally to my former Professor of Botany.) Miss Eastwood, on her side, put on the appearance of broad-mindedness by expressing her admiration for Jepson's beautiful literary style and by acknowledging his

ability to organize material and publish books, but then she would add devastatingly, that as a botanist, he was a "muddle-head!"

Little wonder, is it, that out of this divergence of personality and scientific outlook the legend developed that Miss Eastwood and Dr. Jepson were unfriendly, but such was not exactly the case. It will be remembered that in the '90's, Miss Eastwood was an assistant editor of Jepson's journal, *Erythea*, and she was a faithful contributor to many of its pages. Then, in 1935, at Kew, I saw and heard how cordial and congenial the two California botanists could be when Miss Eastwood and I were invited by Dr. Jepson to have lunch with him. Four years later he accepted the Academy's invitation to sit at the head table at the luncheon honoring Miss Eastwood on her eightieth birthday. And once, I have heard, he even accepted an invitation to address a meeting of the California Botanical Club, which was to be more closely identified with Miss Eastwood than was the California Botanical Society with Jepson.

While I have been at the Academy, the exchange of correspondence between Miss Eastwood and Dr. Jepson was slight, but what there was was usually maintained at a decorous and dignified level. I do not recall any letter in which he expressed what his real feelings, botanical or otherwise, may have been; but I do recall once when Miss Eastwood sent him a note that must have given him a twinge. Early in 1946, fifteen years after LEAFLETS OF WESTERN BOTANY had been founded, it suited Dr. Jepson's convenience to recognize the existence of the journal by submitting to Miss Eastwood and me a note for publication. Naturally Miss Eastwood and I were very happy, but she did not tell Jepson so. Instead she sent him a brief note accepting the manuscript and thanking him for his "tacit approval" of our journal! I can well imagine that on the receipt of that note, Jepson may have wished he had *again* resurrected his own journal, *Erythea*, for the publication of *Habenaria Greenei*, instead of presenting the "enemy's camp" with so vulnerable an opening.

Miss Eastwood lived with the better things of life and what was to her ugly or sordid had no place. So accustomed had she become to looking on the good side of things, she seemed at times to lose the ability to perceive evil. In this regard, I recall the time I went to see Alfred Lunt and Lynn Fontanne in Molnar's "The Guardsman," a film which Miss Eastwood recom-

mended as something not-to-be-missed. Afterwards, wondering how she could be so positive and naive in her belief in the wife's virtue, I told her that the plot, to me, could lend itself to quite a different interpretation, no more complimentary to the wife than to the husband. Immediately she saw the point, but would have none of it: "Only a person with an evil mind could look at it that way," said she! (Miss Eastwood was a staunch feminist, and her reaction to "The Guardsman" might well have resulted from her conviction of feminine virtue and masculine vice.)

Although Miss Eastwood was almost puritanical in her moral outlook, she took delight in flouting trivial social conventions, acts that showed both her disregard for convention as such and her independence in thought and action. Because I was not yet around, I can't remember her daringly short ankle-length skirts which she persisted in wearing, though fashion of the '90's decreed "street-sweepers"; but I do recall the touch of pride in her voice when she recounted her audacity in ignoring the so-called dictates of fashion. Another infringement of custom occurred when she, a lady, drank beer at a luncheon in the main dining room of the Hotel Amstel in Amsterdam because the day was warm and she wanted it — and how delighted she was when the late Dr. H. A. Spoehr, in fun, chided her for her indiscretion.

When it came to conversation, she had no hesitancy in describing matters that would be banned from parlor conversation by such people who would call a "leg" a "limb" to be polite. One of her most dramatic and annihilating remarks in this way came when she was addressing her many friends and admirers at a luncheon given by the San Francisco Garden Club in the ballroom of the Fairmont Hotel on the occasion of her ninetieth birthday. She had arrived at the luncheon in good spirits but a trifle shaken because she had had a fall at her home that morning. Word of the tumble had got around through the throng, and too many were tiringly solicitous as to how she was. When she arose to speak, before extending her appreciation and thanks for the luncheon, she quieted all further remarks "from the floor" — not by telling in polite terms that she had had a slight tumble, but rather that she had lost her balance and had "sat down hard on my rump, and, of course, that wouldn't hurt anyone!" I can still remember how delightfully shocked

the ladies of the audience were — Alice Eastwood, the unconventional and unpredictable, had scored again.

Another incident will not only illustrate Miss Eastwood's disregard for trivial conventions, but also her lack of concern about her clothes, just so they were neat and appropriate. In June, 1937, Miss Eastwood, Dr. Isabel McCracken, and I were preparing to leave for a visit with Mr. and Mrs. James K. Moffitt at their ranch near Yorkville in Mendocino County, when Miss Eastwood slipped on one of the paths in Golden Gate Park and sat down in a puddle. Her skirt was a sight with mud and water, and though it was too late for her to return home for a change of clothes, she was quite equal to the situation. Back in the Academy, off came her skirt which she cleaned with generous applications of fresh water, and she left on the journey wearing her petticoat as an outer skirt, while the wet overskirt was draped on the back of the car seat to dry *en route!*

Miss Eastwood's disregard for the appearance of her clothes reminds me of the story told of a prominent San Francisco banker, who, when urged by an acquaintance to dress better and more in keeping with the position he occupied, replied: "Why should I be bothered? When I am here in San Francisco, everybody knows who I am, and when I am elsewhere, nobody cares who I am."

Miss Eastwood liked the good and the beautiful in their many manifestations, but things that were complex, overly ornate, or ostentatious did not appeal to her or might even repel her. This preference for what was simple applied not only to art and music but also to such essentials as food and clothes. A simple French dressing on a salad was preferred to mayonnaise; butter, pepper, and salt enhanced the flavor of good vegetables that would, for her, be ruined by an elaborate sauce; gum drops were her favorite candy. In the matter of clothes she was more frugal than simple in her choice, but certainly she never indulged in any fastidious furbelow merely to be in fashion. Love for what she called "pure music" led her to prefer chamber music to operatic or even symphonic works, and a composer like Haydn was preferred to Wagner or Richard Strauss. In painting and sculpture the love of what was good but simple could also be noted — when she and I visited the Louvre in 1935, she took me to see Mona Lisa and Whistler's Mother rather than to see Reubens;

the Winged Victory and Venus de Milo were sought out among the sculptures. She was fond of poetry and the works of the English and American nineteenth century writers were her delight and joy. "Best sellers" were rarely her choice; she preferred, rather, to reread an old work which was tried and true. Among the novels, those of Henry James were perhaps her favorites. She liked to read mystery novels for pleasure and relaxation and never missed one that might be serially published in her favorite magazine, "The Saturday Evening Post."

Food is an essential matter in the life of everyone, but with Miss Eastwood it could also furnish an absorbing topic for conversation as well as an important part of social and family correspondence, while the preparation of food in her kitchen nook at home partook of a recreational activity. Almost invariably the Thursday afternoon meetings of the California Botanical Club would begin with Miss Eastwood's recital of what she had had for lunch, told with such vividness and attention to detail that one could not help but be interested, if not entertained. Not infrequently she would go back years or decades to some meal that was particularly memorable and would recount with all the gusto of a recent occurrence a mushroom soup prepared after a long trek over Coast Range hills, a trailside picnic lunch relished on a walking trip in the mountains, or an omelette enjoyed at a little restaurant in Paris.

Her memory for details was most impressive, and in her letters, accounts of food at some dinner party were related at length whether the party was at the home of a friend or was hosted by Miss Eastwood at her favorite restaurant, the Fly-trap, in San Francisco. The preparation of food was not an irksome task to be performed because of necessity, but rather an adventure to be anticipated with enjoyment and performed with spirit. For many years, as an octogenarian or older, she did most of her own cooking, and one of her chief means of recreation and relaxation evenings after work was to prepare jellies, preserves, and pickles for herself or her friends. Certainly in the manner of living, the matter of food was much more important than the matter of clothes to Alice Eastwood.

As a teacher, Miss Eastwood proceeded in much the same way as she did as a cook — she would follow a set course or a given recipe to a degree, but would vary it enough to make the pro-

cedure experimental and, at least for her, interesting and adventurous. That is the way she would cook, and that, according to her account, is the way she taught school. Certainly that is the way she taught the rudiments of systematic botany to the members of the California Botanical Club and the taxonomy of cultivated ornamentals to the class of Golden Gate Park gardeners. Her manner of presentation was picturesque and lively and, because of frequent anecdotes or appropriate allusions to literature and the arts, highly entertaining. Neither teacher nor pupil had a dull time in Alice Eastwood's class.

No matter where she might be, in a palace or humble home, Miss Eastwood was democratically interested in people and her grasp and appreciation of human nature made her the friend of anyone she might be with. She could appreciate the lofty aspirations of the soul and could comfort the heartaches of the afflicted. She could make herself at home in such an antiquated inn as the one where we stopped at Bell Springs on our way to Red Mountain in Mendocino County; or she was equal to the elegance of Colonel Stephenson Clarke's English estate where, she later recounted gleefully, she had had no chance to keep the prim and proper maid from unpacking her disheveled traveling bag and getting her ready for bed! Because her contacts with people everywhere were so real and sincere, she counted her friends by hundreds — from station houses in the Yukon to isolated ranches in California and Indian agencies in the Southwest, thence to the Atlantic and across to Europe. Alice Eastwood was a real person and was appreciated by real people regardless of social position.

As a conversationalist, Miss Eastwood was probably not what one would call "brilliant," but certainly she was delightful and adequate company — whether she was in a dingy lamp-lighted dining room at Bell Springs, in an oak-paneled drawing room in Sussex, or with a group of congenial friends in San Francisco. She was an excellent story-teller and, with a keen sense of humor, could be highly entertaining, but she also liked more serious conversation and would openly express her opinion on controversial topics of current interest. Sometimes, as I have already indicated, she could be outspokenly frank about matters not generally discussed, and at times in her frankness she would express opinions about herself or her friends or acquaintances

or Academy affairs that might better have been left unsaid. Certainly conversation was not dull when Miss Eastwood was in the party!

On our field trips, Miss Eastwood occupied the back seat of the car and from there directed the procedure of the expedition and took care of pressing the plants. We would drive along slowly until some plant would attract us and we would then stop. If the location proved particularly favorable, Miss Eastwood would collect in the vicinity of the car while I would go farther away in search of other plants. On our trips I was always more interested in collecting intensively in a restricted area, Miss Eastwood desired to collect extensively over more territory: if only we could stop longer, I was certain I would discover another treasure; Miss Eastwood was just as certain that the treasure was up the road and around the next bend. So we did well together: Eastwood and Howell covered much ground intensively!

Besides being a good scientist, Miss Eastwood was a good business woman. When she was young she knew the hardships of poverty and learned the value of money the hard way. In Denver she worked to help herself through high school and it wasn't until after her graduation when she was assured a small but regular income from teaching that she could feel she had what we now glibly speak of as "security." From her youthful experiences and memories together with that courage that was native to her, she knew she would be equal to any emergency that might arise and was never fearful of what the future might hold in the way of business or financial reverses. "The trouble with people," she would often remark, "is that they don't know how to be poor." In all her business dealings she had several dicta that governed her activities: "a state of debt is a state of danger"; "don't put all your eggs in one basket"; and "don't be afraid to take a loss if you dispose of something undesirable." Because she was alert to current events and trends, she was an astute security investor and knew when and how to heed advice on sales and purchases. When her estate was entered for probate, it was valued at more than \$89,000.

This substantial fortune was not amassed by miserly saving. She was extravagantly generous, but she was also frugal. "Save in order to give," was one of her frequent remarks, and the way she saved was to cut out expenses she considered unnecessary —

costly food, costly clothes, costly living, but enough of everything for good and adequate keep. With what she saved she showered her relatives, her friends, the Academy, and her favorite philanthropies with frequent and generous gifts. Her gifts to the Academy came chiefly as supplementary support for activities in the Botany Department and as gifts of botanical books to the Academy Library.

How many thousands of dollars she gave to the Academy will never be known since her gifts went back "b.c.," and continued "a.d." — "before the conflagration" and "after the disaster" of 1906. Just as examples of Eastwoodian generosity to the Academy I might cite a few specific instances: following the 1921 expedition of the Academy to the Gulf of California, she divided her salary over an extended period with Ivan M. Johnston so that he could work on the collection while studying at the University of California; in 1935 she paid my round trip transportation (as well as her own) to the Sixth International Botanical Congress in Amsterdam and, while we were away, she employed Mrs. H. P. Bracelin to help in the Botany Department; and among outstanding gifts of books may be mentioned the complete set of *Gardeners' Chronicle* and Humboldt, Bonpland, and Kunth's *Nova Genera et Species Plantarum*, each costing several hundreds of dollars.

Another way in which Miss Eastwood was indirectly generous to the Academy was in her support of our journal, *LEAFLETS OF WESTERN BOTANY*, a responsibility in which I also shared. Shortly after I came to the Academy, when it became apparent that, under Dr. Jepson's editorship, the pages of *Madroño* would no longer be open to my papers, I suggested to Miss Eastwood the idea of having a journal of our own. At first she was against the idea and gave for her reason the great expense involved in subsidizing a scientific botanical magazine. In this she was much more practical than I, because my only concern over such a project was: where would we get enough material to fill even four small issues each year. Late in the summer of 1931, her attitude changed and on January 16, 1932, Vol. 1, No. 1, of our journal was issued. Through the years our project was constantly subsidized by both of us, but up to the close of Vol. 5 in 1949 when Miss Eastwood withdrew her connection with the journal, she had contributed more than half the amount of subsidy. No exact

figure is available, but it is likely that she contributed more than \$2000 over the years to the support of a journal that has brought inestimable benefit to the Academy's Botany Department. The only major editorial change ever suggested for the journal was proposed by the late John W. Stacey, who offered to develop it into a larger botanical magazine; but neither Miss Eastwood nor I wanted to change our editorial policy, and I did not wish to undertake expanded editorial responsibilities.

Because she had learned the real value of money, Miss Eastwood ran her department as frugally as her home and stretched a meager budget phenomenally far. Not many administrators could show the results Miss Eastwood obtained as a consequence of her business-like management and personal generosity. She was not a gambler and instinctively shunned chances that might involve financial loss, but by a combination of good business foresight and by gambling on the value of the German mark after World War I, she acquired for the Academy Library Martius' *Flora Brasiliensis* for about \$50 in American money. She would boast that no organization in which she was an officer was ever insolvent; in her clubs and societies the annual financial statements always showed a balance in black.

It was in her field work where she was especially generous to her department and the Academy. During all her years at the Academy she never submitted an expense account for a collecting trip taken to obtain specimens for the herbarium and for distribution to other institutions and botanists. When it is remembered for how many decades she was curator of the Botany Department, one can realize how many hundreds of longer or shorter field excursions she took and how many hundreds of dollars she devoted to the cause. In 1931, Miss Eastwood and I together bought an automobile which we used on field trips, but two other cars purchased later were bought for field work by Miss Eastwood alone. Expenses on field trips were paid almost entirely by Miss Eastwood or were shared by friends who went on trips with us. Miss Eastwood's statement in her departmental report, reiterated each year, "all expenses for field work paid by the curator," indicates, over the years, a most generous gift to the Academy and to Botany.

Alice Eastwood was a memorable botanist but probably more people remember her because in some way or other she revealed

herself to them as a great person. Her philosophy of life was broad and good and over the years she exhibited most of those virtues that have been designated by Archbishop John Ireland as "the abiding wisdom of life":

"To be content with one's lot, to keep a rein upon passion, to be the thing one seems, to look for happiness within, not without, to be patient with the patience that makes all things easy, to face danger with dauntless front, to retain a calm mind under the frowns as well as the smiles of fortune, to be ready to forego all in order to be free in thought and act, to make the golden mean one's rule of life, to love peace . . . Such virtues are the abiding wisdom of life."¹

The Eastwoodian character measures up well with most of these attributes, but she certainly did not have "the patience that makes all things easy." Her impatience could be as violent as her kindness and generosity were great, and the force and bite of that impatience were dreaded by all who ever encountered it.

Francis Meehan has defined a "character" as "a man with enough character to be himself, to do things in his own dramatic way, to revel in poetry, imagination and wit, and to be blissfully unaffected by what people think about him."² By all these criteria, Miss Eastwood was a "character," and a rare one, too.

Because in all phases of her life Alice Eastwood sought out the better things and continually reflected the inspiration and true pleasure she herself derived from the works of the great, I believe it is fitting to close these sketchy and halting reminiscences with words from Goethe, who has expressed sentiments so congenial to the spirit of our dear friend and mentor:

"Men are so inclined to content themselves with what is commonest; the spirit and the senses so easily grow dead to the impressions of the beautiful and perfect, that every one should study, by all methods, to nourish in his mind the faculty of feeling these things. For no man can bear to be entirely deprived of such enjoyments: it is only because they are not used to taste of what is excellent, that the generality of people take delight in silly and insipid things, provided they be new. For this reason, . . . one ought every day at least to hear a little song, read a good poem, see a fine picture, and, if it were possible, to speak a few reasonable words."³

1. Introduction to the Odes and Epodes by Archbishop Ireland, in *The Odes and Epodes of Horace*, edited by Clement Lawrence Smith; issued by The Bibliophile Society. Boston. 1901.

2. From the book, "Living Upstairs," by Francis Meehan, copyright, 1942, by E. P. Dutton & Co., Inc.

3. *Wilhelm Meister's Apprenticeship* [Wilhelm Meisters Lehrjahre], translated from the German of Goethe by Thomas Carlyle, Book 5, Chapter 1. Chapman and Hall. London, 1871.

FURTHER ADDITIONS TO THE KNOWN
FLORA OF ARIZONA

BY THOMAS H. KEARNEY

A paper entitled "Recent Additions to the Known Flora of Arizona," by Thomas H. Kearney, Elizabeth McClintock, and Kittie F. Parker, was published in *LEAFLETS OF WESTERN BOTANY*, February 28, 1953 (vol. 7, pp. 1-11). This paper enumerated 4 genera and about 20 species discovered after the publication, in September, 1951, of *Arizona Flora*, by Kearney and Peebles. Also, additional collections of rare taxa already included in the book were recorded in the paper cited.

The present contribution is designed to bring our knowledge of the state flora further up to date by: (1) listing the genera and species brought to light since publication of the previous article in *LEAFLETS*; (2) presenting further distributional records of rare taxa; and (3) calling attention to changes of taxonomic status as indicated in recently published monographs and revisions.

The taxa added in the present paper to the recorded flora of the state number 3 genera and 11 species, making the total number of additions in the two articles 7 genera and 31 species. There has also been a great accumulation of new data on the geographical and altitudinal distributions in Arizona of less rare taxa, but limitations of space preclude the presentation here of this information.

The figure in parenthesis after the name of a genus or species at the beginning of each paragraph of the present article refers to a corresponding page in *Arizona Flora*.

ADDITIONAL GENERA AND SPECIES

EQUISETUM FUNSTONI A. A. Eaton (p. 30). Sycamore Canyon, near Ruby, Santa Cruz County (*Phillips et al.* 3467), identified by W. S. Phillips and confirmed by C. V. Morton. Mr. Morton wrote, however: "I am not at all sure of the proper status of this species. It seems to merge with *E. laevigatum*." As compared with *E. laevigatum* A. Braun (*E. kansanum* Schaffn.), *E. Funstoni* was characterized by W. R. Maxon (in Abrams, *Ill. Fl. Pacific States* 1: 39) as having rougher stems with sharply pro-

jecting silica-bands, a more strongly incurved limb of the sheaths, and, usually, a basal tuft of many-branched sterile stems.

HORDEUM VULGARE L., cultivated barley (p. 96). This was reported by Kittie F. Parker as a common roadside weed near Casa Grande, Pinal County (*Parker 8241*). From the other annual species of *Hordeum* in Arizona it is distinguished by the combination of very long leaf-auricles, a continuous rachis, and sessile lateral spikelets.

PENNISETUM CILIARE (L.) Link (p. 140). Near Oracle, Pinal County, apparently self-seeding from a Soil Conservation Service Planting (*K. F. Parker 7752*), introduced from India. Differs from *P. setaceum* in its shorter panicles (2–10 cm. long), and shorter bristles subtending the spikelets (5–10 mm. long).

ANDROPOGON ISCHAEMUM L. (p. 141). Santa Catalina Mountains, 7500 feet, apparently self-seeding from a Soil Conservation Service planting (*K. F. Parker 8093*), native of the Old World. Differs from our other species of Sect. *Amphilophis* (*A. barbinodis*, *A. saccharoides*) in having the pedicellate spikelets as large as the sessile ones and the panicle usually dull purple, not silvery-white. The nodes of the culm are glabrous.

QUERCUS AJOENSIS C. H. Muller. This oak, apparently endemic to the Ajo Mountains, western Pima County, at elevations of 2500 to 4000 feet, has been described recently by Professor Muller (*Madroño 12: 140–145*). Of the species previously recorded from Arizona its closest relative is *Q. turbinella* Greene (p. 218), from which it differs in the longer spinose teeth and waxy glaucous-whitish surface of the leaves. Specimens more or less intermediate between *Q. ajoensis* and *Q. turbinella* were recorded by Muller as occurring at lower elevations in the Ajo Mountains and in the Castle Dome and Kofa mountains, Yuma County.

RUMEX NEMATOPODUS Rech. f. (*Leafl. West. Bot. 7: 134,–1954*). This recently described species is known from Arizona by two collections in the Huachuca Mountains, Cochise County, 7000 to 9000 feet (*Jones* in 1903, the type-collection, and *Lemon 2879*), and has been collected also in New Mexico and Chihuahua.

SISYMBRIUM KEARNEYI Rollins (*Leafl. West. Bot. 7: 15, 16*). This species is known only by 2 collections in Grand Canyon National Monument, northeastern Mohave County (*McClintock*

52-481, 481a, the latter the type-collection), growing under overhanging cliffs, flowering April and May. In the key to *Sisymbrium* (p. 336) it would come nearest to *S. elegans*, distinguished therefrom by its whitish (not purple) petals and straight anthers only about 1 mm. long (anthers in *S. elegans* about 2 mm. long and more or less curved and twisted).

ASTRAGALUS ARGOPHYLLUS Nutt. (p. 458). This species is now established definitely as a component of the flora of Arizona, specimens collected in the Grand Canyon National Monument, Mohave County, in the ponderosa pine belt, elevation about 7000 feet (*Cottam 13690*) having been identified by Mr. Rupert C. Barneby as *A. argophyllus* var. *pephyragmenoides* Barneby.

ASTRAGALUS MONUMENTALIS Barneby (Leaflet West. Bot. 7: 35). This is the species described without name in the paragraph in small type (p. 470) and is known only by the type-collection from Garfield County, Utah, and the collection from near Kayenta, Navajo County, Arizona (*Peebles & Fulton 11928*). The position of this species in the key to *Astragalus* (pp. 446-456) cannot be determined until more and better material is available. Of species previously recorded from Arizona, Mr. Barneby thought *A. desperatus* Jones to be nearest *A. monumentalis*.

LATHYRUS LATIFOLIUS L. (p. 478). Prescott, Yavapai County (*Kuntze in 1896*), cited by C. Leo Hitchcock (Univ. Wash. Publ. Biol. 15: 11, 64), a European species that is naturalized extensively in the United States. It is readily distinguished from all other species of *Lathyrus* reported from Arizona by the broadly winged stems. The leaves are bifoliolate, with well-developed tendrils and very large stipules; the reddish or white corolla is 15-20 mm. long.

LATHYRUS PAUCIFLORUS Fern. (p. 478). Carrizo Mountains, Apache County (*Standley 7383*). The Arizona collection was referred by Hitchcock (*ibid.* pp. 26, 69) to subsp. *pauciflorus* var. *utahensis* (Jones) C. L. Hitchc. The species as a whole ranges from Idaho and Washington to Colorado, Utah, northeastern Arizona, and California. It differs from the other large-flowered species of Arizona (*L. eucosmus*, *L. zionis*), with corolla 20 mm. or longer, in having broader, ovate or ovate-lanceolate leaflets, these usually at least one-half as wide as long.

MENYANTHES TRIFOLIATA L. Discovery of this semiaquatic plant of the *Gentianaceae* in Woolsey Lake, southern Apache

County, about 8000 feet (*Rhoton in 1952*) adds another genus to the known flora of Arizona. The plant is readily distinguished from all other Arizona *Gentianaceae* (pp. 645-650) by its trifoliolate, long-petiolate, basal or alternate leaves, and racemose flowers. The genus, which is monotypic, is often placed in a separate family, *Menyanthaceae*.

ROTHROCKIA CORDIFOLIA Gray (*Matelea cordifolia* Woodson). Canyon Diablo, Ajo Mountains, western Pima County, 5000 feet (*Supernaugh in 1952*, identified by Kittie F. Parker). This plant is now to be included in the flora of the state. Some of the characters by which it is distinguished from the related *Lachnostoma arizonicum* were mentioned in *Arizona Flora* (p. 666).

LYCOPUS AMERICANUS Muhl. Lakeside, southern Navajo County, 7000 feet, in wet soil (*Rhoton in 1952*). This species, which occurs almost throughout the United States and Canada, is characterized by petiolate, deeply incised or pinnatifid leaves, and nutlets with entire apex. The Palmer collection in 1869 mentioned in *Arizona Flora* (p. 747) under the name *L. lucidus* Turcz. evidently belonged to a different species, having sessile, merely serrate leaves and nutlets corky-winged at apex. There is no satisfactory evidence, however, that Palmer's specimens were collected in Arizona.

ADDITIONAL RECORDS OF RARE TAXA

ANACHARIS Densa (Planch.) Marie-Victorin (p. 70). St. David, Cochise County, in fresh water ponds (*Goodding 74-53*).

ANACHARIS CANADENSIS (Michx.) Planch. Big Lake, Apache County (*Peebles 15155*).

STIPA LOBATA Swallen (p. 117). Huachuca Mountains, Cochise County (*Goodding 952-49*, identified by Peter Raven, referred previously to *S. columbiana* Macoun). The latter species (p. 118) apparently is limited in Arizona to the northern portion, the specimen on which was based its reported occurrence in the Santa Catalina Mountains (*Gentry 3953*) having been re-identified by Peter Raven as *Stipa Pringlei* Scribn.

STIPA LETTERMANI Vasey (p. 118). North Rim of Grand Canyon, 8500 feet (*Merkle 621*).

PHALARIS MINOR Retz. (p. 131). Near Casa Grande, Pinal County (*K. F. Parker 8243*).

ERIOCHLOA ARISTATA Vasey (p. 133). Castle Dome Mountains,

Yuma County (*Grandell 57*).

PANICUM ANTIDOTALE Retz. (p. 137). Tucson, Pima County, "now common at roadsides" (*K. F. Parker 7750*).

ELEOCHARIS CARIBAEA (Rottb.) Blake (p. 154). Near Tempe, Maricopa County (*Blakely 12a, 1798*).

CAREX ROSSII Boott (p. 162). North Rim of Grand Canyon, 8500 feet (*Merkle 483, 500*, identified by J. T. Howell).

ERIOGONUM FLAVUM Nutt. (p. 240). South entrance of Grand Canyon National Park, Coconino County, about 7000 feet (*K. F. Parker et al. 6168*).

RUMEX MEXICANUS Meisn. (p. 244). Point of Pines, Graham County, 6000 feet, in ponderosa pine forest (*Bohrer 449*).

KOCHIA SCOPARIA (L.) Schrad. (p. 261). What is presumably var. *subvillosa* Moq. has been collected also near Peach Springs, Mohave County (*Macfarland in 1952*), where it was reported to be "very common in deep, disturbed soil."

STELLARIA UMBELLATA Turcz. (p. 293). North Rim of Grand Canyon, 8000 feet, in a wet meadow (*Merkle 556*).

SAGINA SAGINOIDES (L.) Karst. (p. 295). Kaibab Basin and North Rim of Grand Canyon, Coconino County, 8000 to 9000 feet, in wet places (*Merkle 586, 601*).

RANUNCULUS OREOGENES Greene (p. 316). Mount Trumbull, Mohave County, in pine forest (*McClintock 52-367*).

RORIPPA CURVISILIQUA (Hook.) Bessey (p. 340). Point of Pines, Graham County (*Bohrer 431*). This, like the other Arizona specimens, is not typical *R. curvisiliqua*. They may represent an undescribed species.

DRABA ASPRELLA Greene (p. 346). Northwestern Gila County (*Parker & McClintock 6852*). This collection is of var. *asprella* (var. *typica* C. L. Hitchc.).

CHORISPORA TENELLA (Pall.) DC. (p. 355). Cottonwood, Yavapai County, "sometimes a bad weed in grain fields" (*Zaleski in 1953*).

SEDUM STENOPETALUM Pursh (p. 359). Kaibab Basin, Coconino County, 8000 feet (*Bryant in 1952*).

CERCIS OCCIDENTALIS Torr. (p. 404). Toroweap Valley, Mohave County (*McClintock 52-358, 550*).

LUPINUS BICOLOR Lindl. (p. 417). Santa Catalina Mountains, Pima County, 7500 feet (*Strickland 6*).

LUPINUS OSTERHOUTIANUS C. P. Smith (p. 418). North Rim of

Grand Canyon (*Merkle 696*).

LUPINUS LEMMONII C. P. Smith (p. 419). What seems to be this species has been collected at Point of Pines, Graham County, 6000 feet (*Bohrer 308*).

MELILOTUS OFFICINALIS (L.) Lam. (p. 422). This species occurs also at Montezuma Well, Yavapai County, and Point of Pines, Graham County.

CALLITRICHE (p. 521). The following collections, in addition to those cited by Fassett and mentioned in the earlier paper (*Leaflet West. Bot. 7: 3*), apparently represent the two species now recognized as occurring in Arizona: *C. verna* L. emend. Kütz, Chuska Mountains, Apache County (*Monson 43, in 1937*); Santa Catalina Mountains, Pima County (*Goodding in 1943*). *C. heterophylla* Pursh emend. Darby var. *heterophylla*, Kaibab Plateau, Coconino County, 8000 feet (*Goodding 257-48*); Sabino Canyon, Pima County (*Thornber in 1903, 1904, and 1907, Eastwood in 1930*).

ELATINE BRACHYSPERMA Gray (p. 557). South Rim of Grand Canyon (*Collom in 1952*).

VIOLA UMBRATICOLA H.B.K. (p. 561). Collected in the Santa Catalina Mountains also by K. F. Parker (*No. 8109*).

CIRCAEA PACIFICA Asch. & Magn. (p. 604). Escudilla Mountain, southern Apache County (*Parker & McClintock 7511*).

PTERYXIA DAVIDSONI (Coult. & Rose) Mathias & Constance (p. 619). Between Diamond Creek and White River, southern Navajo County, about 6000 feet, abundant in sandy soil among pines (*Rhoton in 1952*).

LAMIUM AMPLEXICAULE L. (p. 739). Cottonwood, Yavapai County, a weed in grain fields (*Zaleski in 1953*).

PENSTEMON BARBATUS (Cav.) Roth (p. 772). Subsp. *trichander* (Gray) Keck has been collected also near Keam's Canyon, northern Navajo County (*Deaver 3802*).

GALIUM BIFOLIUM Wats. (p. 812) has been found at another station on the North Rim of Grand Canyon, Walhalla Plateau, 8500 feet, in open, grassy places (*Merkle 506*).

LOBELIA CARDINALIS L. (p. 828). In lines 1 and 2 delete "except the low western portion," this plant (subsp. *graminea*) having been collected in Havasu Lake Wildlife Refuge on the Colorado River (*Monson in 1953*).

DICORIA BRANDEGEI Gray (p. 893). The range has been ex-

tended definitely to Apache County by a collection in the north-eastern corner of the state (*Deaver 4048*).

COREOPSIS CARDAMINEFOLIA (DC.) Torr. & Gray (p. 908). Delta of Williams River, Mohave County, 350 feet (*Monson in 1953*).

BIDENS HETEROSPERMA Gray (p. 911). Escudilla Mountain, southern Apache County (*Parker & McClintock 7609*).

HYMENOXYIS ARGENTEA (Gray) K. F. Parker (p. 927). Northwest of Pinedale, southern Navajo County, 6500 feet (*Parker & McClintock 6830*).

PSATHYROTES RAMOSISSIMA (Torr.) Gray (p. 943). Near Ajo, western Pima County (*Fouts in 1952*).

CHANGES OF TAXONOMIC STATUS¹

PSEUDOTSUGA TAXIFOLIA (Poir.) Britton (p. 55). The botanical name of the Douglas-fir of the Rocky Mountain region (including Arizona), as accepted by Elbert L. Little, Jr. (Check list of native and naturalized trees of the United States. Agric. Handb. 41, U. S. Dept. Agric. 1953, p. 307) is *Pseudotsuga Menziesii* (Mirb.) Franco var. *glauca* (Beissn.) Franco.

BROMUS sect. BROMOPSIS (pp. 77-78, species 5 to 10). A revision of the North American species of this section by H. Keith Wagon (Brittonia 7: 415-480, -1952), would alter considerably the status of species occurring in Arizona. *Bromus ciliatus*, *B. texensis*, *B. anomalus*, and *B. Orcuttianus* (species 6, 7, 8, and 9 in Arizona Flora) were excluded, the species recognized by Wagon as found in this state being: *B. inermis* (No. 5), *B. lanatipes* (Shear) Rydb. (included in Arizona Flora as a variety of *B. anomalus*, No. 8), and *B. frondosus* (No. 10), also *B. Porteri* (Coul.) Nash (in Arizona Flora as synonym of *B. anomalus* Rupr.), *B. mucroglumis* Wagon, and *B. Richardsoni* Link (in Arizona Flora as synonym of *B. ciliatus* L.). Identifications by Wagon of specimens in the herbarium of the University of Arizona indicate the following ranges: *B. lanatipes*, Coconino and Yavapai counties; *B. frondosus*, Yavapai and Santa Cruz counties, in addition to the counties enumerated in Arizona Flora; *B. Porteri*, Apache and Coconino counties; *B. mucroglumis* ("identified as *B. anomalus* in most herbaria"), Graham, Cochise, Santa Cruz, and Pima counties; *B. Richardsoni*,

¹ In bringing to attention the views of other authors concerning various components of the Arizona flora, the present writer does not necessarily accept their conclusions.

Apache, Coconino, Yavapai, Graham, Cochise, and Pima counties.²

POA LONGILIGULA Scribn. & Williams (p. 85). This taxon was reduced to synonymy under *P. Fendleriana* Steud. by V. L. Marsh (Amer. Midland Nat. 47: 232, 235,—1952).

YUCCA (p. 185). J. M. Webber, in a publication entitled "Yuccas of the Southwest" (Agric. Monogr. No. 17, U. S. Dept. Agric. 1952, 79 pp., 70 plates), differs in many particulars from the treatment by Mrs. McKelvey that was followed in Arizona Flora. *Yucca Thornberi* and *Y. confinis* were thought to have originated as hybrids between *Y. baccata* and *Y. arizonica* (Webber p. 29). *Yucca Newberryi* was reduced to synonymy under *Y. Whipplei* (p. 33). *Yucca Harrimaniae* was given as a synonym, in part, of *Y. neomexicana* Woot. & Standl., which does not occur in Arizona (p. 43). The plant referred to *Y. Harrimaniae* in Arizona Flora is probably *Y. Baileyi* Woot. & Standl., of which *Y. Standleyi* McKelvey was cited by Webber as a synonym (p. 49). *Yucca navajoa* was reduced to a variety of *Y. Baileyi* (p. 51). *Yucca utahensis*, *Y. verdiensis*, and, perhaps *Y. kanabensis* were considered by Webber to be products of hybridization between *Y. elata* and some other species (p. 62).

RUMEX OCCIDENTALIS Wats. (p. 245). The specimens from the White Mountains, doubtfully referred to as *R. occidentalis*, are believed by Wm. A. Weber (personal communication) to be *R. densiflorus* Osterhout. Professor Weber pointed out that they have the rootstock horizontal, black, and covered with rootlets as in *R. densiflorus*, rather than vertical and carrot-like, as in *R. occidentalis*.

POLYGONUM AVICULARE L. (p. 247). Specimens with relatively broad, mostly obtuse leaves are referable to *P. buxiforme* Small, which was cited by Fernald (Gray's Man. ed. 8, p. 580) as a synonym of *P. aviculare* var. *litorale* (Link) W. D. J. Koch. A specimen from Sunset Crater, Coconino County (*Eastwood & Howell 6941*) has been identified by J. F. Brenkle as *P. buxiforme*. (

STELLARIA LONGIFOLIA Muhl. (p. 293). The specimen from Sierra Ancha, Gila County (*Gould 3802*) cited in Leaflet West. Bot. 7: 9, proves to be a form of *Arenaria saxosa* Gray.

² A specimen, previously identified as *Bromus catharticus* Vahl of Section *Ceratochloa* (p. 77), has been referred by G. Ledyard Stebbins, Jr., to *B. Haenkeanus* Presl. It is from Houserock Valley, Coconino County (*Darrow 3017*).

CERASTIUM ADSURGENS Greene (p. 295). This appears to be a narrow-leaved form of *C. nutans* Raf., to judge from a specimen from New Mexico identified by Greene himself as *C. adsurgens*.

MYOSURUS (pp. 313, 314). As treated by Gloria R. Campbell (The genus *Myosurus* in North America. *El Aliso* 2: 389-402, -1952), only three species were recognized as occurring in Arizona. These are *M. minimus* L., *M. cupulatus* Wats., and *M. nitidus* Eastw. (*M. Egglestonii* Woot. & Standl.). *Myosurus minimus* is represented in this state by subsp. *minimus*, recorded by Campbell for Navajo, Coconino, Yavapai, and Pima counties; and by subsp. *montanus* G. R. Campbell, given by her only for Coconino and Mohave counties in Arizona, but probably more widely distributed in the state. To the latter subspecies probably belong specimens that were referred in Arizona Flora to *M. aristatus* Benth., a species not recognized by Campbell as occurring in Arizona.

LATHYRUS (pp. 477-479). "A Revision of North American Species of *Lathyrus*" by C. Leo Hitchcock (Univ. Wash. Publ. Biol. 15: 1-104, -1952) necessitates some modification of the treatment by the same author in Arizona Flora. In the description of the genus, line 2, insert "(except in the introduced *L. latifolius*)" after the word "species," and in line 5 insert "or red" after "purple." *Lathyrus latifolius* L. and *L. pauciflorus* Fern., not previously recorded as occurring in Arizona, were mentioned on a preceding page of this article. The name *Lathyrus leucanthus* Rydb. should be substituted for *L. laetivirens* Greene (No. 3 in Arizona Flora, p. 478). This is represented in Arizona by *L. leucanthus* var. *laetivirens* (Greene) C. L. Hitchc., which differs from var. *leucanthus* in having more numerous leaflets and usually well-developed but often unbranched tendrils. For *L. brachycalyx* Rydb. (No. 2 in Arizona Flora) substitute *Lathyrus zionis* C. L. Hitchc., deleting the reference to occurrence in the Dos Cabezas Mountains. The remaining species (*L. arizonicus*, *L. graminifolius*, and *L. eucosmus*) are unchanged from the treatment in Arizona Flora.

VIOLA PURPUREA (p. 561). Delete and substitute:

7. *Viola aurea* Kellogg. Gila County, North Peak, Mazatzal Mountains, 6000 feet (*Collom* 48 in 1933) and Sierra Ancha (*Crooks et al. in 1939*). Nevada, California, and central Arizona.

The species is represented in our state by ssp. *arizonensis*

Baker & Clausen (Madroño 12: 11) which is known only by these two collections, that by Crooks et al. being the type.

CLARKIA AND GODETIA (pp. 592, 593). *Godetia* has been merged with *Clarkia* in a recent paper by Harlan Lewis and Margaret Lewis (Madroño 12: 33-39). If this point of view is accepted, the two species treated in Arizona Flora under *Godetia* would be respectively, *Clarkia purpurea* (Curtis) Nels. & Macbr. subsp. ined., and *C. epilobioides* (Nutt.) Nels. & Macbr.

DODECATHEON (p. 638). From a paper by H. J. Thompson entitled "The Biosystematics of Dodecatheon" (Contr. Dudley Herb. 4: 73-154), a revised key to the Arizona species is abstracted and should be substituted for the one in Arizona Flora.

1. Stigma enlarged, more than twice the diameter of the style; flowers 4-merous; filaments very short, free or united by a thin membrane. Leaves linear to linear-oblongate, gradually tapering into the petiole; corolla-lobes magenta or lavender 3. *D. alpinum*
1. Stigma not enlarged; flowers 5-merous; filaments free or united into a tube (2).
2. Leaf-blades thickish, oblongate, tapering into the petiole; corolla-lobes pink or pale purple; filaments united, the tube 1.5-3.5 mm. long; anthers 3-5.5 mm. long 2. *D. radicum*
2. Leaf-blades thin, ovate or oval, abruptly contracted into the petiole; corolla-lobes white; filaments free or slightly united, less than 1 mm. long; anthers 6.5-8 mm. long 1. *D. Ellisiae*

DODECATHEON ELLISIAE Standl. (p. 639) was reduced by Thompson (ibid. p. 151) to a subspecies of *D. dentatum* Hook., but it would seem that the characters given for distinguishing it from subsp. *dentatum* (ibid. p. 150), and the wide geographical separation of these taxa, would justify maintenance of *D. Ellisiae* as a species.

DODECATHEON ALPINUM (Gray) Greene (p. 639). The Arizona plants belong to subsp. *majus* H. J. Thompson (ibid. pp. 142, 143).

POLEMONIUM (pp. 694-696). A monograph of this genus by John F. Davidson was published in 1950 (Univ. Calif. Publ. Bot. 23: 209-282). In this paper, *P. albiflorum* Eastw. and *P. filicinum* Greene were reduced, with reservations, to synonymy under *P. foliosissimum* Gray (ibid. pp. 226-229). No mention was made of *P. flavum* Greene.

MOLDAVICA (p. 737). The proper name of this genus would appear to be *Dracocephalum* and the species (p. 738) would be

D. parviflorum Nutt. (*Moldavica parviflora* Britton).

DRACOCEPHALUM (p. 738). The name *Physostegia* for this genus has been proposed for conservation by Elizabeth McClintock (Leaf. West. Bot. 5: 171, 172).

VALERIANA (pp. 818-820). Changes in the treatment of the Arizona species indicated by Frederick G. Meyer in a revision entitled "Valeriana in North America and the West Indies" (Ann. Mo. Bot. Gard. 38: 377-503, -1951), were mentioned in the earlier paper (Leaf. West. Bot. 7: 8, 9). The most important of these changes was the reduction of *V. acutiloba* Rydb. to subspecific status as *V. capitata* Pall. ssp. *acutiloba* (Rydb.) F. G. Meyer and the reduction of *V. ovata* Rydb. to synonymy under *V. arizonica* Gray. In Arizona Flora *V. acutiloba* was treated as a species and *V. ovata* as a variety thereof. Characters (taken from Meyer's descriptions) that differentiate these taxa are:

Basal leaves usually undivided and mostly oblong- or oblanceolate- to obovate-spatulate; corolla 4-8 mm. long. . . . *V. capitata* ssp. *acutiloba*
 Basal leaves mostly undivided and ovate to suborbicular, but sometimes pinnate; corolla 5-15 mm. long *V. arizonica*

Meyer (ibid. p. 408) cited, under *V. capitata* ssp. *acutiloba*, a collection in the White Mountains (Apache County) and one on the San Francisco Peaks (Coconino County). Under *V. arizonica*, the most widely distributed species in Arizona, he cited (ibid. p. 410) collections in Navajo, Coconino, Yavapai, Greenlee, Graham, Gila, Maricopa, Cochise, and Pima counties.

PLUCHEA CAMPHORATA (L.) DC. (p. 884). The Arizona specimens have been referred by R. K. Godfrey to *P. purpurascens* (Sw.) DC. var. *purpurascens* (Jour. Elisha Mitchell Sci. Soc. 68: 257).

ARTEMISIA (pp. 938-942), Section *Seriphidium* (species allied to *A. tridentata*). The North American species of this section were the subject of a cytotaxonomic study by George H. Ward (Contr. Dudley Herbarium 4: 155-205, -1953). The only important change from the treatment in Arizona Flora is the reduction of *A. nova* (No. 12) to subspecific status, as *A. arbuscula* Nutt. subsp. *nova* (A. Nels.) G. Ward (p. 183).

SENECIO NEOMEXICANUS Gray (p. 950). Insert at end of paragraph 3: "It is very like the type of *S. Metcalfei* Greene, which was referred by Greenman (Ref. 362, 3: 179) to *S. tridenticulatus* Rydb."

CONCERNING FRUIT-COLOR IN
DIRCA OCCIDENTALIS

BY JOHN THOMAS HOWELL

In the spring of 1953, Hubert Vogelmann gave a good account of the genus *Dirca* in the Asa Gray Bulletin (n. ser. 2: 77-82), but his description of *D. occidentalis* followed details given in California manuals and floras where a fruit red in color is attributed to the plant. Since a note that I published in 1930 on the fruit-color of our western leatherwood has been generally overlooked, I am printing here the letter I wrote Mr. Vogelmann in May, 1953, about it.

I first came to work in the herbarium of the California Academy of Sciences about 24 years ago, and then, as now, I devoted most of the daylight hours of my recreational time to botanical field work (the main difference being that *then* I seemed to have an abundance of relatively free and unencumbered time, whereas *now* I seem to have no time at all). I was happy to have an excuse to go into the field and invited projects that today, unfortunately, I would not have time to pursue.

One of these projects, early suggested to me by Miss Eastwood, was the investigation of the fruiting condition in *Dirca occidentalis*, our western leatherwood. Since the occurrence of this shrub in the Berkeley Hills above the University of California was well known to me, I had no difficulty in finding shrubs in fruit on June 15, 1930. In August of the same year, I published a short account of what I had found (Madroño 2:13).

It is scarcely surprising that this brief note, buried under so general a title as "Plantae Occidentales," should have been overlooked by Abrams and McMinn, but, when I recall how assiduously Prof. Jepson culled *Erythea* and Madroño for references for his Flora of California, I am surprised that my former Professor of Botany also overlooked my report in his 1936 account of *Dirca* (Fl. Calif. 2:556,-1936). I do not believe the oversight was intentional.

When finally I came to write my own flora, I went out of my way to mention the color of the fruits (cf. Marin Flora, p. 196,-1949). But here, too, alas, the fact is all but lost, for who would think to look for a fact almost unknown to science in a flora so provincially restricted! It would seem as if I had sought to conceal from you what you wished to know. After reading your excellent account of the genus *Dirca* in the recent Asa Gray Bulletin, I hasten to write to tell you I have not purposely tried to be cryptic!

The color of the fruit, incidentally, is yellowish-green.

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LEAFLETS *of* WESTERN BOTANY

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NOTES ON CERTAIN OREGON PLANTS
WITH DESCRIPTIONS OF NEW VARIETIES

BY MORTON E. PECK

Willamette University, Salem, Oregon

It may be worth while at this time to place on record certain facts and observations concerning a variety of Oregon plants that have not to our knowledge been adequately published. To these records we would add some comments on several specific and subspecific entities that have been assigned to the state, and finally, include brief diagnoses of several varieties not to our knowledge hitherto recognized. We have then the following to offer:

RHYNCHOSPORA ALBA (L.) Vahl. Found in a sphagnum bog about 5 miles north of Florence, Lane Co., Sept. 8, 1921 (*Peck 26438*), associated with *Darlingtonia* and *Drosera*. It was once collected by Henderson near Florence.

CAREX PAUCICOSTATA Mack. A *Carex*, now in the herbarium of Willamette University, collected by Dr. G. C. Bellinger of Salem, near the summit of Mt. Ashland, Jackson Co. in Aug., 1952, was identified as this by Mr. J. T. Howell. This is seemingly the first record for the state.

ALLIUM PENINSULARE Lem. We collected material of this in southeastern Jackson Co. (*Peck 16745*) and have no other record of its occurrence in the state.

ALLIUM ROGUENSE Peck. In a sense this is a *nomen nudum*, but almost too "nudum" to be decently discussed. The trouble began with the type collection, which consisted of several plants of *A. Bolanderi* without the bulbs, but mixed with some bulbs of a *Brodiaea*. Dr. Ownbey easily convinced us that such was the case, which we were already suspecting. So vanishes another chimaera.

CYPRIPEDIUM CALCEOLUS L. var. *PARVIFLORUM* (Salisb.) Fern. Our knowledge of this plant in Oregon is very scant. On May 10, 1946, we were shown a specimen in flower, in a garden at Galice, Josephine Co., by a Mrs. Lewis, owner of the garden, who told us she had transplanted it from a boggy depression on Peavine Mountain, about four miles southwest of Galice.

Corallorhiza maculata Raf. var. *immaculata* Peck, var. nov. A specie caule

graciliore, segmentis perianthii angustioribus 10–12 mm. longis, labro albo immaculato differt.

Stem averaging more slender than in the species, the perianth-parts, except the lip, averaging longer and decidedly narrower, the lip pure white, wholly unspotted.

The type, in the herbarium of Willamette University, was sent us for determination several years ago, by Mr. Howard Taylor, an amateur collector, who found it in low woods along Mosby Creek 10 miles east of Cottage Grove, Linn Co., Oregon. The plant was plentifully distributed over several acres.

ALNUS RHOMBIFOLIA Nutt. The northernmost record we have of this species west of the Cascades, is that of a considerable colony, narrow and paralleling the Willamette River, some 6 or 7 miles long and quite including the city of Salem, and sharply islanded by *A. rubra* territory.

BETULA FONTANA L. var. *GLANDULIFERA* Regel. We have material (*Peck 22003*) of this from a seemingly isolated colony at an altitude of about 5000 ft. on the eastern slope of the Cascade Mts. in extreme northwestern Klamath Co. This is a considerable southward extension of the known range, hitherto terminating with Clackamas Lake, eastern Clackamas Co.

QUERCUS GARRYANA Dougl. The invasion by the Oregon Oak of the region east of the Cascades is of some interest. A little way east of The Dalles, Wasco Co., on the Columbia River, the oak leaves off in that direction but continues southward in sporadic patches on bold eastward slopes and in shallow depressions. This succession continues to about Tygh Valley. For several miles to the northward of that point, the growth is exceptionally luxuriant.

POLYGONUM PERSICARIOIDES H.B.K. Several examples of this were collected by Dr. R. C. Erickson on Malheur Wildlife Refuge, Harney Co., and sent us for determination. Probably the species is adventive from far southward and eastward.

ERIOGONUM FLAVISSIMUM Gdgr. This has had a somewhat confused history. In his Manual, the author passed it as *E. Cusickii* Jones, a very obvious error, due mainly to the fact that, while working on this section of the genus at the Gray Herbarium, he came upon a fragment of what he here recognizes as *E. flavissimum*, bearing the label *E. Cusickii* Jones and agreeing perfectly so far as comparison was possible with material he had in hand, both from the same general locality. *Eriogonum Cusickii* Gdgr.

did not help the case, being only a synonym of *E. strictum* Benth., or no more than a subspecies. Miss Stokes reduced *E. flavissimum* to subspecific rank under *E. ovalifolium* Nutt., in which she was followed in Abrams' Flora. *Eriogonum flavissimum* is on the whole a clearly marked species, apparently very local in distribution, 8 to 20 miles west of Burns (Peck 19377, 21484, 25405, 25406).

ERIOGONUM PYROLAEFOLIUM Hook., as we know it, is a highly variable species, often with a much-elongated caudex deeply buried with the last season's growth at ground level densely clothed with old leaf-bases, with the peduncles seldom over 6 cm. long, and with rays of the umbel 6 mm. or less. The variability is mainly in the pubescence of the leaves, which varies from short and scant to densely villous-hirsute. The least pubescent material is mainly from south of our territory but we have it from Crater Lake, but beyond this point to the northward there is a regular gradation to the very pubescent form. This has long been known with us as var. *coryphaeum* T. & G., a variant for which there seems no good reason to continue to maintain. However, near the jagged summit of Broken-top Mt. in southwestern Deschutes Co., there occurs a form fairly well set off by characters unrelated to pubescence. This we would designate

Eriogonum pyrolaeifolium Hook. var. **Bellingeranum** Peck, var. nov. A specie pedunculis gracilioribus laxis 10-12 cm. longis, radiis umbellae gracillimis 15-18 mm. longis, dentibus involucri latioribus quam longioribus vix acutis, differt.

Type in the herbarium of Willamette University, collected Sept. 10, 1951, by Dr. and Mrs. G. C. Bellinger near the summit of Broken-top Mountain, southwestern Deschutes Co., Oregon. The new variety is clearly marked by the relatively long and rather lax peduncles, the much longer and more slender rays of the umbel, and the broader and scarcely acute teeth of the involucre.

MONTIA HALLII (Gray) Greene. A plant of somewhat uncertain status, the type collected by Elihu Hall in 1870 somewhere in the Willamette Valley, but like much of Hall's material without definite locality record. We have examined the type in the Gray Herbarium. It is scant and poorly preserved, but appears more closely related to *M. Chamissoi* (Ledeb.) Dur. & Jack. than to *M. fontana* L., to which it has sometimes been referred. In

vegetative characters our material more closely resembles the latter, but the corolla, though small, is markedly larger, well developed, and quite regular. Collected on a seepage bank, 3 miles north of Medford, Jackson Co., March 30, 1940 (*Peck 20502*).

ARENARIA RUBELLA (Wahl.) Sm. A dwarf, densely cespitose and pulvinate *Arenaria* with rather thick obtusish leaves about 5 mm. long that has puzzled several taxonomists to whom material has been submitted occurs on the exposed outermost point of The Heads, near Port Orford, Curry Co. Finally Dr. Bassett Maguire referred it without comment to this polymorphic species. *Arenaria rubella*, as now accepted in many quarters, is more often a high-mountain plant, occurring in two or three forms in the mountains of Oregon as well as sometimes at much lower elevations, but none of which seems to match this phase very closely. We hope some good arenariologist will assign it a respectable subspecific status.

STELLARIA HUMIFUSA Rottb. Quite plentiful on grassy tide flats near Garibaldi on the northern Tillamook Co. coast (*Peck 24182*), and once from Waldport on the southern Lincoln Co. coast (*Peck 13496*). Abrams' Flora would exclude the species entirely from our territory.

CERASTIUM SEMIDECANDRUM L. This small European species is established along the immediate coast of extreme northern Lane Co. (*Peck 20719*).

MOENCHIA ERECTA (L.) Gaertn., Mey. & Schreb. Found growing rather plentifully on gravelly flats in central Jackson Co. (*Peck 24833*). An anomalous European genus apparently now established with us.

SILENE OREGANA Wats. var. *FILISECTA* (Peck) Peck. This has no *raison d'être*, being a rather extreme form of *S. oregana*, and was originally described by the writer as *S. filisecta*, a name we now find in Abram's Flora in synonymy under *S. montana*, doubtless an error.

SILENE ORARIA Peck of the Manual is reduced to *S. Douglasii* var. *oraria* (Peck) Hitchc. & Mag. for doubtless sufficient reasons. In Abrams' Flora it is in clean synonymy under *S. Douglasii*.

ANEMONE, Tribe *ANEMONANTHEA* DC. There is some confusion as to the proper status to be assigned to most of the familiar entities of this tribe occurring in Oregon, the only species ac-

cepted unquestioningly being *A. deltoidea* Hook. and the others often treated as varieties of the eastern *A. quinquefolia* L. or quite ignored. On the whole we consider Fernald's treatment of this group, with its key (*Rhodora*, vol. 30, Sept., 1928), far clearer and more logical. In our territory each of the entities involved has a fairly definite range, as follows: *Anemone oregana*, dry meadows and open slopes along the coast and eastward nearly through the Canadian Zone on the western slope of the Cascades, but the distribution through much of the Willamette Valley discontinuous. *Anemone felix* is found sporadically in and about the margins of sphagnum bogs on the coast of southern Lincoln Co. and northward apparently beyond our territory. *Anemone Lyallii* in Oregon occurs mainly in the Hudsonian Zone of the Cascades. *Anemone Piperi* occupies parts of the middle eastern slope of the Cascade Mts. northward, and also, at nearly equivalent elevations, ranges through the Blue and Wallowa mountains and beyond. *Anemone deltoidea* ranges the length of the state and from the Coast Mts. to the lower slopes of the Cascades. Clear specific characters for each member of the group are not difficult to find and were used by Fernald in his key. The only exception being *A. felix*, which had not been described at the time the key was published. Of the last-named species no mention is made in Abrams' Flora, not even a relegation to synonymy.

DELPHINIUM ULIGINOSUM Cur. This was collected on a stony seepage flat near the head of Chewaukan River, Lake Co., in July, 1927 (*Peck 15411a*), which is our only record for the state.

BERBERIS PINNATA Lag. We have material of this from the extreme southwestern corner of Curry Co., collected by Mr. Oliver Matthews, in March, 1937.

LEPIDIUM LATIFOLIUM L. A European immigrant established in moist slightly alkaline soil near Columbia River, 6 miles east of Umatilla, Umatilla Co. Collected in June, 1944 (*Peck 25171*).

LEPIDIUM OBLONGUM Small. Collected and seemingly well established on a high bank of Columbia River, near Arlington, Gilliam Co. (*Peck 22829*). Probably native of South America.

ARABIS MODESTA Roll. Found rather plentiful on a damp cliff at Galice, Josephine Co. (*Peck 24055*), near Hellgate, on Rogue River, the type locality. The large brilliantly colored flowers

mark this as one of our finest as well as rarest species of the genus.

TELLIMA ODORATA How. In Abrams' Flora this is relegated to synonymy under *T. grandiflora*. Even in the field the distinctive features of the species seem sufficiently clear. It occurs nearly through the Columbia Gorge and at various points down the immediate coast line as far as Coos Co. It averages taller, more robust and more coarsely hirsute than *T. grandiflora*, with the herbage uniformly a deeper green. The petals average longer than in *T. grandiflora* and are usually pure white in early anthesis instead of greenish tinged. As the specific name implies, the flowers are very fragrant, the odor persisting throughout the day. We have grown the two species side by side for many years, and believe our observations are correct.

HEUCHERA MERRIAMII Eastw. We found this strongly marked and seemingly rare *Heuchera* on a dry but well-shaded cliff about 2 miles south of Bolan Lake in extreme southern Josephine Co., July 20, 1947 (*Peck 13547*). Rosendahl et al. (Monograph of the Genus *Heuchera*) assume that this is a hybrid, *H. pilosissima* F. & M. \times *H. rubescens* Torr. This seems scarcely probable, at least in this case, since the former of these species is not known to occur within less than 40 miles of our locality, and the latter not within a much greater distance.

RIBES DIVARICATUM Dougl. is a somewhat variable species in the matter of pubescence, but otherwise commonly quite stable. A form occurs, however, on the Oregon coast, southward, that differs markedly from all other examples we have examined. This we would designate

Ribes divaricatum Dougl. var. *rigidum* Peck, var. nov., ramulis crassis rigidis primo puberulis dense canescentibus; spinulis permultis magnis interdum 2 cm. longis basi 6 mm. latis; foliis crassiusculis firmis supra sparse puberulis venis crassis subtus prominentibus; tubo calycis minute puberulenti vel glabro.

Branchlets stout and rigid, the younger shoots canescent with a dense fine pubescence; prickles numerous, straight or slightly curved, large, often 2 cm. long and 6 mm. thick at base; leaves thick and stiff, the veins deeply impressed above, stout and prominent beneath, the upper surface sparsely strigose, the lower with a short dense velvety pubescence.

Type, *Peck 23968*, in herbarium of Willamette University, collected in a moist thicket near Goldbeach, Curry Co., Oregon, July 24, 1945.

Ribes inerme Rydb. var. *subarmatum* Peck, var. nov. A specie baccis aculeis 12-20 gracilibus armatis differt.

Differs from the species in having the berries armed with 12-20 slender prickles more than half as long as the diameter of the fruit.

Type, *Peck 16729*, from a moist bank along Dead Indian Road, 12 miles northeast of Ashland, Jackson Co., Oregon, July 7, 1931. This locality is well outside the regular range of typical *R. inermis*. The variety would have more weight, if more material were available from the same general area.

POTENTILLA PARADOXA Nutt. We have this from the bank of the Snake River in northeastern Malheur Co. (*Peck 23997*) and from Hart Lake, Lake Co. (*Peck 26841*).

POTENTILLA INDIGES Peck. Though not so much as recognized even in synonymy in Abrams' Flora, this still seems to us worthy of specific standing. We have seen nothing from our territory at least, to match it in leaf-characters and in the small relatively abundant flowers. We know it only from damp meadows along John Day River, near John Day, Grant Co., where at least formerly it was quite plentiful.

POTENTILLA MACROPETALA Rydb. We have material of this seemingly little-known species from the summit of Saddle Mountain, Clatsop Co., collected by Mr. John Davis, State Entomologist of Oregon, June 10, 1952. It seems amply distinct from *P. gracilis* Dougl., to which it has recently been relegated in synonymy.

POTENTILLA ANOMALIFOLIA Peck. In Abrams' Flora this name appears in synonymy under *P. Drummondii*. So far as we know, it has been collected only in the type locality, where it was found in some abundance. The two species are very unlike both in leaf-characters and inflorescence as well as in habit.

POTENTILLA VERSICOLOR Rydb. This is given "fine-print" recognition in Abrams' Flora, with the type locality, Gearhart Mt., Lake Co. We have in the herbarium of Willamette University two or three specimens from about Fish Lake, Steens Mts., and one from Mirror Lake, Wallowa Mts. (*Peck 17790*).

RUBUS BARTONIANUS Peck. The total range of this, perhaps the most strikingly beautiful species of the genus west of the Rocky Mts., consists only of the lower walls of Hell's Canyon of the Snake River Gorge. It forms huge erect clumps often 6 to 10 ft. high, which when in bloom resemble over-sized rose bushes densely clothed with white flowers as large as those of thimble berry. The proposed Hell's Canyon Dam, when and if

it materializes, will probably lead to the complete extermination of this noble shrub, unless it is rescued by domestication. This is another species that escaped Abrams' Flora.

SOPHORA LEACHIANA Peck. We described this interesting plant some years ago (*Madroño* vol. 6, Jan., 1941) from inadequate material collected by Mrs. Lilla Leach at Rand Ranger Station, near Galice, Josephine Co. The diagnosis is faulty and somewhat misleading, but in May, 1946, we secured good specimens (*Peck 24076*), and would now amend the description to read as follows:

Stems mostly arising singly from elongated rootstocks, usually branched, sometimes from the base, 3-4 dm. high, finely grayish-tomentose; leaves several, somewhat crowded above, 1-2 dm. long, the leaflets 19-33, broadly oblong, rounded at both ends, 1-2 cm. long, thin, villous-tomentose and paler beneath, thinly appressed-pubescent above; raceme usually solitary and terminal, 7-15 cm. long, the flowers 20-50, on pedicels 5 mm. long or less; calyx broadly cylindrical-campanulate, strongly gibbous above, 7-9 mm. long, the teeth short and broadly triangular; petals greenish-white, 9-12 mm. long; fruit (immature) strongly curved upward, on a stipe 3-4 mm. long, several-seeded, constricted between the seeds, densely short-villous-tomentose and silvery.

We have seen no mature fruit of this species. Most of the flowers wither and fall entire following anthesis, but a few legumes undergo at least partial development, though we find no evidence that any reach maturity. We have no record of the plant except from the type locality and immediate neighborhood. It is one of the most remarkable of that group of narrowly localized endemic species occurring in Josephine and Curry counties south of the great canyon of Rogue River.

LUPINUS UNCIALIS Wats. We reported this diminutive lupine several years ago from extreme southern Malheur Co. We have since taken it (*Peck 25263*) from a good-sized colony 18 miles north of Frenchglen, Harney Co.

MEDICAGO MINIMA Guffb. var. *PUBESCENS* Webb. Well established on gravelly flats, central Jackson Co. (*Peck 24852*). Native of Europe.

ASTRAGALUS LYALLII Gray. We collected this near Adrian in eastern Malheur Co. (*Peck 25926*), the only record we have for the state.

ASTRAGALUS TYGHENSIS Peck. In Abrams' Flora this is relegated to synonymy under *A. Spaldingii*. It is clearly a quite distinct, as well as an apparently strongly localized species. Of the two

species in question, *A. tyghensis* has somewhat stouter and more coarsely villous stems, leaflets mostly broader, elliptic or elliptic-oblong, and the distinctly larger corolla clear light yellow, instead of white or ochroleucous. The known range of *A. tyghensis* covers high open slopes above Deschutes River in central Wasco Co. from Maupin to Tygh Valley, and a few miles in the opposite direction.

ASTRAGALUS PECKII Piper. Hitherto this seems to have been recorded only from the neighborhood of the type station, northwestern Deschutes Co. Material collected on pumice sand 10 miles south of Chemult, Klamath Co. (*Peck 29131*), gives a clearer idea of the vegetative characters of the species than do any of the examples previously examined by us. The prostrate stems above the short woody base sometimes reach a length of 3 dm. and live over to the second or probably the third season and remain more or less clothed with the persistent, indurated, and very acute rachises of the dead leaves, which thus take the form of long needle-like spines. This is another of the "fine-print" species of Abrams' Flora.

OXYTROPIS DEFLEXA (Pall.) DC. var. **SERICEA** T. & G. was collected in the deep canyon of Hurricane Creek, Wallowa Co., July 24, 1944 (*Peck 25574*).

OXALIS OREGANA Nutt. It has long been recognized that this species as it occurs in the more northerly portion of its range differs in several particulars from that of the more southerly portion, mainly California, the latter being *O. Smallii* Knuth, which is not recognized by Jepson as being distinguishable from the typical form. The two are almost identical morphologically. The northern form averages a little smaller, with white or pale pinkish petals usually under 2 cm. long, while the southern plant has bright lavender or rose-colored petals 2-3 cm. long. The above facts were pointed out by Lewis S. Rose (*Leafl. West. Bot. 1:49,50,—1933*), but the suggested nomenclatorial combination was not actually made, which we now propose:

Oxalis oregana Nutt. var. **Smallii** (Knuth) Peck, comb. nov. *O. Smallii* Knuth, *Notizbl. Bot. Garten Berlin 7:308,—1919*). We have no record of this variety in Oregon except that of a considerable colony near the mouth of Galice Creek in the canyon of Rogue River, northwestern Josephine Co. (*Peck 24087*).

ELAEAGNUS ANGUSTIFOLIUS L. Extensively planted as a roadside

shade tree in northern Oregon east of the Cascades. It has freely escaped and become rather widely established in parts of northern Malheur and southeastern Baker counties.

MENTZELIA CONGESTA (Nutt.) T. & G. This seems not to have been hitherto recorded from Oregon. Specimens were collected by Mr. John Davis "along Crooked Creek," Malheur Co., in July, 1952, and are now in the herbarium of Willamette University.

ARCTOSTAPHYLOS VISCOSISSIMA Peck, of our Manual, is better considered a well-marked variety of *A. hispidula* How.

Gentiana Sceptum Griseb. var. *cascadensis* Peck, var. nov., caule robustiore pallido; foliis latioribus elliptici-lanceolatis vel ovatis sursum paulo redactis; corolla latius infundibuliforme 3.5-4 cm. longa.

Stem stout, pallid; leaves broader than in the species, elliptic-lanceolate to ovate, little reduced upward; corolla more broadly funnellform.

Type, *Peck 19817*, from a damp grassy swale, 5 miles southeast of Silver Creek Falls, Marion Co., Oregon, August 8, 1937.

A strikingly handsome plant, very unlike the typical form of the species, which in Oregon at least is found mainly in bogs along the immediate coast and on the lower Columbia. The type was from "Fort Vancouver," collected by Douglas. Specimens from farther north than the type locality of the variety, e.g., *J. W. Thompson 3649*, from Lost Lake near Mt. Hood, and one from Clackamas Lake, eastern Clackamas Co., by Mrs. R. D. Cooper, show intergradation between the two, especially in leaf-characters.

CUSCUTA GRONOVII Willd. Material of this dodder was brought us from cultivated areas about Ontario, Malheur Co., by Mr. John Davis, of Salem, and is now in the herbarium of Willamette University. It is doubtless adventive from far eastward, where it is extensively distributed.

LINANTHUS BOLANDERI (Gray) Greene. Collected from a considerable colony on the south slope of Sexton Mountain, in northeastern Josephine Co., in May, 1948 (*Peck 24791*). This is the only positive record we have for the state, reports to the contrary notwithstanding.

CRYPTANTHA FRAGILIS Peck. Many years ago material later described under this name was examined by Dr. Ivan Johnston and annotated as undescribed, and we acted accordingly. The specific characters seem fairly distinctive in the light of Dr.

Johnston's work, though the matter seems to have been lost sight of completely. It is apparently a rather local plant of dry stony ground, northern Josephine and Curry counties (Peck 3995, 23782).

PLAGIOBOTHRYAS ASPER Greene. A *Plagiobothrys*, such as one we have from central Wasco Co., is what we are rather assuming Greene had in hand when describing the above. We have not been able to fit our material into *P. tenellus* (Nutt.) Gray, to which *P. asper* has been referred, speaking of *P. tenellus* as we commonly find it. We hope that our single gathering (Peck 26179) may encourage some other collector to be on the lookout for something to match it.

PENSTEMON BARRETTAE Gray. The type locality of this fine *Penstemon*, and seemingly the only one known in the state, has been almost at the vanishing point for some years past, until recently recovered by Mr. John Davis, a *Penstemon* enthusiast but not an exterminator. Mr. Davis shared his scanty collections with us.

PENSTEMON HESPERIUS Peck. This tall *Penstemon* of boggy meadows is apparently known from but two or three stations in the state, besides the type locality, these in Washington and Clackamas counties.

PENSTEMON SUBSERRATUS Penn. Another rare and local *Penstemon* hitherto known south of Columbia River only on the lower north slope of Mt. Hood, has recently been taken by Mr. Davis at two or three points southward in Wasco Co., nearly as far as Tygh Valley.

MIMULUS JUNGERMANNIODES Suksd. Taken on damp cliffs along Deschutes River near Maupin and at Sherar's Bridge, Wasco Co., the latter on June 7, 1950 (Peck 26230). So far as we know these are the only records of the species south of Columbia Gorge.

VERONICA SHERWOODII Peck. Dr. Pennell rejected this, referring it to *V. peregrina* subsp. *xalapensis*. *Veronica peregrina* is definitely an annual and usually short-lived. The type of *V. Sherwoodii*, now in the herbarium of the University of Oregon, was collected in late May, in the canyon of Imnaha River, Wal-lowa Co., at an altitude of little under 5000 ft. It is a small, somewhat matted plant with almost filiform branches, the basal portion semiwoody and persistent and bearing dead, empty and

discolored capsules of the previous season. These are hardly the marks of an annual.

SYNTHYRIS MISSURICA (Raf.) Penn. × *BESSEYA RUBRA* (Dougl.) Penn. The two plants were found growing plentifully and indiscriminately intermingled over a considerable area of open woods along Imnaha River, 23 miles above the town of Imnaha, Wallowa Co., March 25, 1934. The assumed hybrids were unmistakable. The stems of these were relatively taller and more robust than those of *S. missurica* and the leaves relatively longer, and both intermediate between those of the parent species; many, perhaps half of the flowers of the hybrid were apetalous, while in those that were petalous, the corolla was smaller and more unevenly cut than in what we were satisfied was the *Synthyris* parent. Other characters were not closely noted, and unfortunately most of our material of the hybrid was later lost.

CASTILLEJA TAEDIFERA Penn. So far as the writer is aware, the type specimen of this species is the only one in any collection. This he secured in the extreme northeastern corner of Wallowa Co. By some ill luck only enough material was preserved for a single herbarium sheet. This was later submitted to Dr. Pennell for study, but not as a duplicate, but it was not returned and is doubtless safely reposing today in the herbarium of the Philadelphia Academy. Further examination of the neighborhood of the type locality is to be desired.

CASTILLEJA DIXONII Fern. Material of this species now in the herbarium of Willamette University was taken by Mr. John Davis of Salem, in June, 1953, on Saddle Mountain, Clatsop Co. So far as we are aware this is the first record of the occurrence of this species in Oregon. What has been previously reported and has been described under this name in our Manual, is the more recently described *C. litoralis* Penn.

PLANTAGO MACROCARPA C. & S. A considerable detached colony of this more northerly plantain occurs in a boggy meadow at Yachats, in extreme southwestern Lincoln Co. (*Peck 20162, 21606*).

SAMBUCUS GLAUCA Nutt. × *SAMBUCUS CALLICARPA* Greene. We would thus dispose of several specimens now in the herbarium of Willamette University, collected by Mr. Oliver Matthews at the following points in northwestern Oregon: 5.5 miles north of Linnton, May 8, 1939; near Corbett, June 18, 1940; Holbrook,

June 17, 1940; 1 mile north of Globe, May 8, 1939. The last of these stations is in Columbia Co., the others in Multnomah Co. The examples are all from tall shrubs or small trees, approaching *S. glauca* in size and well above the usual size of *S. callicarpa*. The inflorescence is intermediate in form, being broad conical or strongly convex. The fruit is deep reddish-purple, not at all glaucous. Both of the supposed parent species are plentiful along the lower Columbia. *Sambucus callicarpa* regularly flowers much earlier in the season than *S. glauca*, but due, perhaps, to the relatively uniform conditions as to temperature and moisture in the Gorge there is a certain overlapping in the flowering periods of the two species, naturally favoring hybridization.

ERIGERON AUSTINAE Greene. In his "Revision of the North American Species of *Erigeron*," Dr. Arthur Cronquist assigns this to subspecific status under *E. chrysopsidis* Gray, which in most respects it closely resembles, except that in the common form the plants average somewhat smaller with the herbage more condensed and the ligules entirely undeveloped or only barely indicated. On June 11, 1948, we collected on Hart Mountain, Lake Co., specimens (*Peck 25791*) that seemed in every respect the ordinary *E. Austinae*, except that the ligules were well developed and up to 5 mm. long and the color instead of the bright yellow of those of *E. chrysopsidis*, was very pale yellow or cream or sometimes light lavender. In the same general area was found a variety of intergradations between the wholly rayless and wholly radiate phases. From these observations it appears (and with this Dr. Cronquist has expressed himself as willing to agree) that *E. Austinae* is a sufficiently well-marked, though in respect to the ligules a highly variable, species.

ERIGERON COMPOSITUS Pursh var. **SUBMONTANUS** Peck. The type collection of this and copious material transplanted and grown from the same gathering comprise all the examples we have seen of the variety, as well as of the species west of the Cascade Mts., with the exception of those from the Siskiyou Mts. Dr. Cronquist, doubtless on sufficient grounds, finds the variety too weak to merit recognition, with which we do not disagree.

BAERIA MARITIMA Gray. This plant, occurring on headlands above the sea reportedly from Vancouver Island to California, is certainly rare with us. The only Oregon example we have

seen, now in the herbarium of Willamette University, was brought in from Otter Crest, Lincoln Co., many years ago, by a student.

CHAENACTIS SUKSDORFII Stockwell. A local species closely related to *C. Douglasii* (Hook.) H. & A. but readily distinguishable in the field. It seems hitherto to have been recorded only from southern Washington, but on June 29, 1951, we collected it (*Peck 26336*) near Boardman, Morrow Co. It was growing abundantly over a limited and apparently sharply defined area.

CHAENACTIS STEVIODES H. & A. This has been previously reported from Oregon, but we had seen no specimens from the state until June 16, 1949, when we found it (*Peck 25724*) scattered over a considerable sandy area a few miles southwest of Rome, Malheur Co.

ACHILLEA LANULOSA Nutt. var. *ERADIATA* (Piper) Peck. The type of this was collected by J. C. Nelson at the western base of Mt. Jefferson, Linn Co., in August, 1919, and so far as we know, the entity has not been reported since. The characters as set forth in Piper's description of *A. eradiata* seem rather distinctive and may be worth further investigation.

MATRICARIA CHAMOMILLA L. A considerable colony of this familiar European herb was found June 27, 1951 (*Peck 26341*) along a field border, apparently well established, 8 miles west of Langdon Lake, Umatilla Co.

LACTUCA SALIGNA L. Within the past three or four years, this lettuce has become thoroughly established and is spreading freely in southwestern Marion Co.

LACTUCA MURALIS (L.) E. Mey. This delicate attractive plant has become thoroughly established in deep coniferous woods in the neighborhood of Silver Creek Falls, Marion Co., and has spread extensively within the past few years.

A NEW CALOCHORTUS FROM OREGON

BY MORTON E. PECK

Willamette University, Salem, Oregon

In May, 1948, the writer collected at the foot of the western slope of Sexton Mt. in northeastern Josephine Co., Oregon, specimens of *Calochortus* superficially resembling *C. uniflorus*, and at the time taken for that species. A hasty comparison later

with a series of *C. uniflorus* proved this to be an error. Circumstances, however, prevented a more detailed study at the time, and no more was done until Dr. Marion Ownbey in 1953 made a brief stop in Salem and went over the specimens more carefully, pointing out the more salient features in which they differed from *C. uniflorus*. Later this material was sent to Dr. Ownbey with a request that he describe the new species, and this he consented to do. But in the pressure of affairs, this was delayed until the end of June, 1954, the eve of his departure for a year's absence in Europe, when he returned the material to me to do with as I saw fit. After further delay, when the case seemed rather urgent (the more so since it is something of an event for a new *Calochortus* to turn up north of the Mexican border); I drew up the following, with the hope that it will meet with Dr. Ownbey's approval, especially as the main points in the description as well as the specific name are his own suggestion:

Calochortus indecorus M. Ownbey & M. E. Peck, spec. nov. Bulbo ovoideo 2-2.5 cm. longo tunica crassa rigida; caule modo crasso erecto vel ascendenti non bulbifero 8-12 cm. longo ad inflorescentiam folio basali 2-2.5 dm. longo, 8-10 mm. lato, longo-acuminato inflorescentiam aequante, folio secundo inflorescentiam subtendente prope 1 dm. longo et 3 mm. lato; umbellis 1-3-floris plerumque binis umbella tertia interdum in caule gracile ex axilla folii basalis; bracteis prope 2.5 et 6 cm. longis; pedicellis 4-5 cm. longis, modo crassis; sepalis late lanceolatis, petalis brevioribus, colore non notabile; petalis clare lavendulaceis late obovatis breviter purpureo-barbatis super ad glandulam aliter glabris; glandula paulo depressa subter membrana minute denticulata marginata aliter nuda; antheris oblongis acutis vel obtusis, filamentis multo brevioribus; capsula ovoidea 1.5-2 cm. longa anguste 3-alata valde cernua.

Bulb ovoid with thick dark coat, 2-2.5 cm. long; stem rather stout, not bulbiferous, erect or ascending, 8-12 cm. high below the inflorescence; basal leaf 2-2.5 dm. long, 8-10 mm. wide, long-acuminate, the single cauline leaf closely subtending the inflorescence, 8-10 cm. long, about 3 mm. wide; umbels commonly 2, 2- or 3-flowered, with sometimes a third umbel on a slender stalk from the axil of the basal leaf; bracts about 2.5 and 6 cm. long; pedicels rather stout, 4-5 cm. long; sepals broadly lanceolate, somewhat shorter than the petals and without distinctive coloring; petals broadly obovate, finely erose apically, bright lavender, glabrous on the inner face except for a scant zone of short purple hairs above the gland; gland little-depressed, covered below by the minutely denticulate membrane, but otherwise naked; anthers oblong, acutish or obtuse, much shorter than the slender filaments; capsule ovoid, 1.5-2 cm. long, narrowly 3-winged, strongly nodding.

Type: Peck 24790, foot of west slope of Sexton Mt., Josephine Co., Oregon, May 20, 1948. Not otherwise known.

The new species falls in the subsection *Nudi* of *Eucalochortus*. Its nearest known relative is doubtless *C. uniflorus* H. & A., from which it differs, as Dr. Ownbey emphasizes, in the absence of basal bulblets on the stem and in the much greater length of the latter, which is moderately stout and usually erect.

PUGILLUS ASTRAGALORUM XVI: MINOR NOVELTIES FROM NEVADA

BY R. C. BARNEBY

Wappingers Falls, New York

The four varieties described below are published here in order to make the names available for a treatment of *Astragalus* in Nevada to appear in "Contributions toward a Flora of Nevada," a series of mimeographed papers initiated by the Bureau of Plant Industry, under the direction of Dr. W. Andrew Archer. The four nomenclatural combinations appended have been found necessary in the course of extensive studies of taxonomically complex groups not exclusively and in two cases only marginally involved in the Nevada flora; they will be more fully discussed elsewhere.

Astragalus convallarius Greene var. *finitimus* Barneby, var. nov., a var. *convallario*, cui caeterea persimilis, legumine oblongo breviori ac latiori, 1.3–2.4 cm. longo, 3.4–4 mm. lato, distincta.

UTAH: 3 miles south of Enterprise, Washington Co., 11 June, 1942, *Ripley & Barneby 4967*; type in Herb. Calif. Acad. Sci. No. 300426. NEVADA: Highland Range, west of Caliente, Lincoln Co., *Ripley & Barneby 3487, 6407*.

The present variety was interpreted by the writer (1947, p. 28) as an individual variation of var. *convallarius*, about coordinate with *A. junceus* var. *attenuatus* Jones, but representing the short as opposed to the long extreme in size of the pod. But whereas the pod of var. *attenuatus*, in the type-region near Price, Utah, varies greatly in length in one collection (from 2.5–4.5 cm., for example, in *Ripley & Barneby 8638*), that of var. *finitimus* is absolutely shorter and broader than anything seen from elsewhere in the range of var. *convallarius*. In fact it more nearly resembles the pod of the related *A. diversifolius* Gray, to which I wrongly referred the type (Barneby, 1944, p. 148), before the

true characters of the latter species had been appreciated (Barneby, 1947, p. 27). It might be added that although the flower of var. *finitimus* stands at or below the small extreme of var. *convallarius*, and its pod is smaller, the ovules (18–26) are at or above the extreme number for the species. The var. *finitimus* appears to occupy a restricted island at the southeastern edge of the widely dispersed var. *convallarius*, with which it can be contrasted as follows:

- Pod elongate, linear or linear-lanceolate, 2.5–5 cm. long, 2.5–3.3 mm. wide, 8–18 times longer than its greatest diameter; ovules 13–20 var. *convallarius*
 Pod shorter, narrowly oblong, 1.3–2.4 cm. long, 3.4–4 mm. wide, 4–6 times as long as its greatest diameter; ovules 18–26 var. *finitimus*

ASTRAGALUS OOPHORUS WATS. The plentiful material of this species now available provides a distinct picture of racial differentiation within it, and it is now possible to make out four varieties neatly separated geographically, two of them new:

Calyx-tube broadly campanulate, 4–6.5 mm. long, 2–5 mm. in diameter, over half as wide as long; claws of the wings and keel 6–9 mm. long; blades of the keel half-obovate or -circular, abruptly incurved through 90°–100° to the blunt deltoid apex; gynophore (apparent stipe of the pod) 3.5–8 (10) mm. long.

Petals bicolored, the banner and keel pink-purple, the wing-tips white; pod subsymmetrically ellipsoid, both sutures convexly arched; southern and central Nevada, southeastern California and southeastern Oregon.

Flowers large, the calyx 7–12 mm., the banner 16–23 mm. long; ovules 41–53; range as given, but not of the Charleston Mts. a. var. *oophorus*

Flowers small, the calyx 6–7 mm., the banner about 11 mm. long; ovules 23–28; Charleston Mts., Clark Co., Nevada b. var. *Clokeyanus*

Petals ochroleucous, concolorous, the banner rarely tinged with pale lilac; pod strongly asymmetric, half-ovoid or -ellipsoid, the ventral suture straight or a trifle concave, the dorsal one gibbous-convex; east-central Nevada to northern Arizona and western Colorado. d. var. *caulescens*

Calyx-tube cylindric, (7.8) 8–8.5 mm. long, 3.6–4.4 mm. in diameter, about twice longer than wide; claws of the wings and keel 10–12 mm. long; blades of the keel lunately half-elliptic, gently incurved through about 45° to the triangular apex; gynophore 10–11 mm. long; local in southeastern Nevada c. var. *lonchocalyx*

The synonymy and distribution of var. *oophorus* (here modified only by the exclusion of the Charleston Mt. material) and of var. *caulescens* have been discussed in an earlier paper (Bar-

neby, 1944). The var. *caulescens*, formerly known only from mountains surrounding the Colorado Basin, has now been traced westward into extreme eastern Nevada (Becky Mt., White Pine Co., *Train 3888*, NA). The new varieties are local modifications, apparently endemic to Nevada:

Astragalus oophorus Wats. var. ***Clokeyanus*** Barneby, var. nov., a var. *oophoro*, cui leguminis florumque structura persimilis, floribus multo minoribus, calyce (dentibus inclusis) 6 mm. tantum, vexillo circa 11 mm., carinaque 9.5 mm. longis, habitu toto graciliori, ovulisque minus numerosis (23–28) diagnoscenda.

NEVADA: Lee Canyon Pipe Line Ridge, Charleston Mts., Clark Co., alt. 9000 ft., *Percy Train 2141*; type in Herb. National Arboretum, isotype UC. Known only from the east slope of Charleston Peak, where fairly abundant in yellow pine forest between 8100 and 9100 ft. (*La Rivers & Hancock 513*, NA; *Ripley & Barneby 4979*).

The type-collection was listed by Clokey (1942, p. 216; 1951, p. 130) as *A. artipes* (a synonym of *A. oophorus* var. *caulescens* Jones) and was interpreted by the writer (1944, p. 152) as a small-flowered state of var. *oophorus*, but the discontinuity in variation between the smallest flowers of var. *oophorus* and the largest of var. *Clokeyanus* is marked. The entire plant presents a more slender and delicate appearance than var. *oophorus*, the pod averages smaller (about 2–2.5 cm. as opposed to 3.5–5.5 cm. long), and the ovules are considerably fewer. Presumably var. *Clokeyanus* has been enabled to accumulate small differences in its isolated station, and belongs to the endemic element of the Charleston Mt. flora.

Astragalus oophorus var. ***lonchocalyx*** Barneby, var. nov., a var. *oophoro* calyce cylindrico longiori et pro rata angustiori, carinae laminis oblique ellipticis per 45° tantum in apicem angustioremsensim incurvis, gynophoro leguminis longiori, ovulisque minus numerosis (34–38) absimilis.

NEVADA: Fay, 3 miles east of Deer Lodge, Lincoln Co., alt. 6000 and 6800 ft. in the limestone mountains about the head of tional Arboretum. Apparently local, known only from between 6000 and 6800 ft. in the limestone mountains about the head of the Muddy River, Lincoln Co., Nevada (Highland Range, *Ripley & Barneby 3486*; 24 miles north of Pioche, *Ripley & Barneby 3232*).

The remarkable modification of the flower entitles var. *lonchocalyx* to systematic recognition. The cylindrical calyx-tube

and long narrow petals resemble those of *A. megacarpus* (Nutt.) Gray; but in growth-habit and in the pod it has everything in common with *A. oophorus*.

Astragalus Serenoi (O. Kze.) Sheld. var. *sordescens* Barneby, var. nov., a var. *Serenoi* racemo contractiori, petalis sordide stramineis (alis carinaque tantum purpurascens), calyce angustius cylindrico, necnon legumine oblique ovoideo subuniloculari (septo vix 0.5 mm. lato) separanda.

NEVADA: foothills of the Toquima Range, 7 miles south of Belmont, Nye Co., alt. 6800 ft., *Ripley & Barneby 3673*, flor, 4000, fruct. Cotypes in Herb. Calif. Acad. Sci. Nos. 289610 and 292817. Known only from this locality.

This is the plant which I wrongly identified (1942, p. 113) with *A. Shockleyi* Jones, now believed to represent no more than a form of *A. Serenoi* with relatively narrow pod. An ample series of collections from western Nevada now links up Shockley's type from Fish Lake Valley (probably Esmeralda Co.) with the plumply broad-fruited extreme described as *A. canonicus* Jones, and I now consider both of these supposed species as minor variants of var. *Serenoi*, from which var. *sordescens* stands out sharply in the following particulars:

Peduncles and axis of the raceme together 15–40 cm. long, the pods and usually the flowers far exerted from the leaves; calyx-tube 3–4 mm. in diameter; petals lilac or purple with white wing-tips, strongly graduated, the banner 17–26 mm. long, 4.5–8.5 mm. longer than the keel; pod oblong or oblong-ellipsoid, broadest near the middle, semibilocular, the septum well developed, 2–3 mm. wide var. *Serenoi*
 Peduncles and raceme-axis 6–15 cm. long, the flowers and pods exerted only just beyond the leaves; calyx-tube narrowly cylindric, 2.4–2.8 mm. in diameter; petals sordid straw-color, the keel and wing-tips tinged with dull lilac, the banner 14.5–16 mm. long, only 1.5–2.5 mm. longer than the keel; pod obliquely ovoid, broadest near the base, subunilocular, the septum subobsolete, 0.5 mm. wide or less. var. *sordescens*

Astragalus miser Dougl. var. *tenuifolius* (Nutt.) Barneby, stat. nov. *Homalobus tenuifolius* Nutt. ex T. & G., Fl. N. Amer. 1:353 (1838).

Astragalus bisulcatus (Hook.) Gray var. *nevadensis* (Jones) Barneby, comb. nov. *A. Haydenianus* var. *nevadensis* Jones, Zoe 2:241 (1891). Includes *A. Jepsoni* Sheld., based on *A. demissus* Greene, not Bss. & Heldr.; *Diholcos Jepsoni* (Sheld.) Rydb.

Astragalus calycosus Torr. var. *mancus* (Rydb.) Barneby, stat. nov. *Hamosa manca* Rydb., Bull. Torr. Club 54:17 (1927). *A. mancus* (Rydb.) Wheeler, Rhodora 40:136 (1938).

Astragalus nyensis Barneby, nom. et stat. nov. *A. Nuttallianus* var. *piliferus* Barneby, Leaf. West. Bot. 3:110 (1942).

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OBSERVATIONS ON THE GENUS *SOLIVA* IN CALIFORNIA

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The appearance of Cabrera's (1949) treatment of the genus *Soliva* led to the investigation of some Californian collections in the University of California Herbarium at Berkeley to determine whether species other than *Soliva sessilis* R. & P. occur in this state.

Soliva sessilis is fairly well known in California as a diminutive, weedy annual, occurring at low elevations in the Coast Ranges from Del Norte County southward to Santa Barbara County. The typical achenes of this species have broad entire wings, each wing projecting above the body of the achene, usually as an incurved tooth 1 mm. long (Fig. 1B).

Two conspicuous variations were found in the Californian collections bearing the name *S. sessilis*. The first difference was noted in several collections on the immediate coast: Humboldt County, *J. P. Tracy 1069*; Mendocino County, *Les Koch 812*, *Lewis S. Rose 39154*; San Mateo County, *Ira L. Wiggins 12352*; Santa Barbara County, *Alice Eastwood 143*. The achenes of these plants are destitute of wings but occasionally bear a minute tooth on each margin, little or not projecting above the body of the achene (Fig. 1A). Nuttall (1841) named a plant from in and around Santa Barbara as *S. daucifolia* and described the achenes as "obovate, scabrous, slenderly margined, convex externally, and minutely bidentate at the summit." The author has not examined the type but the Eastwood collection (*No. 143*) of May 16, 1908, from Santa Barbara corresponds to Nuttall's description and closely approximates the other coastal collections listed above. The body of the achenes of these cited col-

lections measure 2 to 2.25 mm. in length, whereas the achene body of *S. sessilis* measures 3 mm. or more in length.

Soliva daucifolia Nutt., as interpreted here, bears striking resemblance to *S. valdiviana* Phil., a species, according to Cabrera (1949), endemic to the Provinces of Valdivia and Llauquihue in Argentina, but adventive in New Zealand. Both species lack wings on the achenes, but *S. daucifolia* has pubescent achenes while in *S. valdiviana* they are glabrous. Philippi (1864-5) recognized the similarity of his plant to *Soliva sessilis* in general ap-

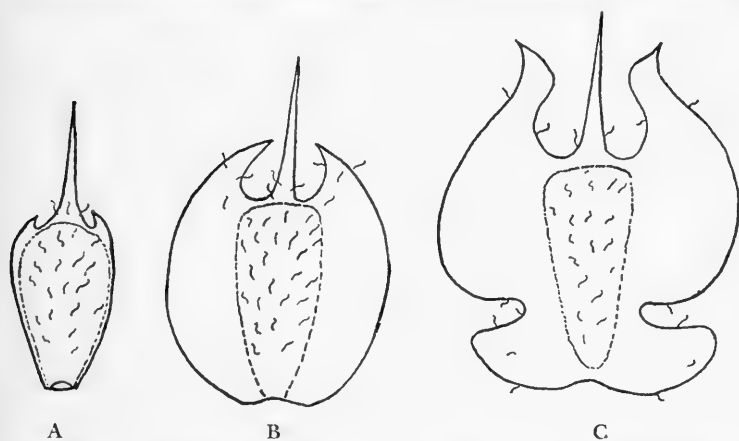


Figure 1. Achenes of *Soliva*, $\times 10$. A. *S. daucifolia* Nutt. (Eastwood 143). B. *S. sessilis* R. & P. (Crampton 1223). C. *S. pterosperma* (Juss.) Less. (Crampton 1121).

pearance, but owing to lack of wings on the achene, named it as a new species. Cabrera (1949) readily accepts *S. valdiviana* as a distinct species.

Previously, botanists have generally referred *S. daucifolia* to *S. sessilis*, but the author feels there is sufficient difference in achene morphology to reestablish Nuttall's plant as a valid species.

A second series of distinctive plants in California has been confused with *S. sessilis*. The achenes of this group have very broad, membranous wings (to 1 mm.) with a conspicuous notch indented 0.5 to 0.75 mm. in the lowest third above the base. Each wing is supplied with a tooth which projects above the body of the achene and usually curves outward (Fig. 1C). These plants agree with *S. pterosperma* (Juss.) Less. in Cabrera's Synopsis

(1949). From what material I have examined, *S. pterosperma* has been collected in the foothills on western slope of the Sierra Nevada, from Tuolumne County north to Eldorado County. The species also occurs in southern Oregon.

The following key is presented for the known species of *Soliva* in California:

Achenes with broad, membranous wings, each wing projecting above the body of the achene as a tooth 1–1.5 mm. long.

Wings conspicuously notched toward the base. 1. *S. pterosperma*

Wings entire 2. *S. sessilis*

Achenes with wings reduced to a hardened marginal callus, or if toothed, the teeth minute and little or not at all projecting above the body of the achene 3. *S. daucifolia*

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PLANT RECORDS FROM NEVADA COUNTY, CALIFORNIA. From August 27 to September 2, 1954, it was my pleasure to accompany John O'Rourke, amateur student of geology, on a trip to the vicinity of Greenhorn Creek, south of Nevada City, Nevada County, California. A spring-fed lake at Buckeye Ridge, a former hydraulic mining area at about 3200 feet, between Chalk Bluff Ridge and Greenhorn Creek, about two miles southeast of Quaker Hill, proved to be a very interesting spot to explore botanically. The rarely reported sedge, *Rhynchospora capitellata* (Michx.) Vahl, was common in a colony about the north side of the lake (my No. 8056), and also along an intermittent stream about one-half mile to the northeast. According to Gale (*Rhodora* 46:115–121,–1944), this species ranges from Nova Scotia and New England southward to Florida and west to the Mississippi River, Texas, and Oklahoma. She also cites collections from the following western localities: Curry County, Oregon; Trinity County, California; and Pitkin Marsh, Sonoma

County, California. Thus it might be expected in the northern Sierra, and more extensive collecting there may serve to fill in the gaps in its distribution.

Nearby grew several shrubs of *Spiraea Douglasii* Hook. (8052), known from several stations in Plumas and Butte counties, but not reported heretofore from so far south. Associated with the *Rhynchospora* and *Spiraea* were *Eleocharis Engelmanni* Steud. (8053), *Panicum occidentale* Scribn. (8054), *Andropogon virginicus* L. (8055), and *Juncus dubius* Engelm. (8058).

On the flood-plain of Greenhorn Creek at 2500 feet, I found several plants of *Hemicarpha micrantha* (Vahl) Pax var. *minor* (Schrad.) Fried. (8029). This plant has been previously known to occur in the Sierra foothills in Calaveras and Tuolumne counties. It may also be reported here from Eldorado County, on the basis of a collection in the herbarium of the California Academy of Sciences: river's edge, North Fork of Cosumnes River 6.5 miles north of Plymouth, at about 800 feet elevation, Eldorado County, October 12, 1930 (*J. T. Howell 5586*).—PETER H. RAVEN.

MEDICAGO PRAECOX DC. NOW IN CALIFORNIA. In April, 1954, the precocious bur-clover was found twice in northern California: flood plain of the Feather River at Oroville, Butte Co., *Raven 6615*; flood bed of Dibble Creek, 1.5 miles north of Red Bluff, Tehama Co., *Howell 29188*. At the latter station, it was conspicuous because of the bright yellowish-green foliage of the maturing plants; *M. hispida* growing with it was quite immature with herbage still succulent and dark green.

Among the bur-clovers naturalized in California, *M. praecox* resembles *M. arabica* and *M. minima* in having the spines channeled or grooved. From the former, *M. praecox* differs in its smaller immaculate leaflets and profoundly laciniate stipules as well as in the venation on the face of the pods, while from the latter *M. praecox* differs in its sparse, more strigose pubescence, in the laciniate-divided stipules, and in the venation on the face of the pods (the face of the pods being nearly smooth in *M. minima*). *Medicago praecox* is indigenous to southern France and the islands of Corsica and Sardinia.—J. T. HOWELL.

A NEW WEED FOR THE SIERRA FOOTHILLS. On August 27, 1954, I found growing as a weed in an orchard at Penryn, Placer County, California, an annual species of *Ambrosia* (Raven 7957). This has since proven to be *Ambrosia artemisiifolia* L., a species which is native to the eastern United States and has been sparingly reported from California. Robbins, Bellue, and Ball (Weeds of California, p. 423, 1951) list it from California but without definite stations. At Penryn, which is at the lower edge of the oak belt, this species grew in association with such weeds as *Ipomoea purpurea* L. (7963) and *Physalis ixocarpa* Benth. (7961).—PETER H. RAVEN.

A HYBRID-SUSPECT IN THE INULEAE. On June 14, 1953, while botanizing on the Hastings Reservation in the Santa Lucia Mountains, Monterey County, California, I was attracted by some plants growing with *Psilocarphus tenellus* Nutt., which I took to be *Stylocline amphibolus* (Gray) J. T. Howell. In habit these plants resembled *Micropus californicus* F. & M., which also grew in the vicinity, but they could not belong to that well-known species since the fruiting pales were spirally, not rotately, arranged. Since the occurrence of *S. amphibolus* in the Santa Lucia Mountains would represent a notable range extension for a rather rare plant, the collection (No. 29070) has been carefully studied.

Now it would seem that the plant which so closely simulates *S. amphibolus* probably represents a bigeneric hybrid between *Micropus* and *Psilocarphus*. It cannot be *S. amphibolus* because, among other differences, the fruiting pales lack the broad apical and marginal membrane characteristic of that species. Instead, the suspected hybrid combines structural features characteristic of the two *Inuleae* with which it grew: the erect habit and indurate fruiting pales with low gibbosity as in *M. californicus*; the spirally arranged pales with reticulate venation as in *P. tenellus*. The leaf-arrangement, which in *Micropus* is alternate and in *Psilocarphus* is opposite, is also intermediate in the suspected hybrid: the lower cauline leaves are alternate or occasionally opposite, while the upper leaves are generally opposite or subopposite. About two dozen plants of the suspected hybrid were seen, and all appeared to be quite sterile.—J. T. HOWELL.

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CHECK LIST OF FERNS AND SEED PLANTS OF FRANCES SIMES HASTINGS NATURAL HISTORY RESERVATION

BY JEAN M. LINSDALE

INTRODUCTION

The Frances Simes Hastings Natural History Reservation was established in 1937 to preserve an area in California's coastal region where native plants and animals may live undisturbed by agricultural use of the land, and to provide for continuous study of vertebrate animals, especially their numbers and relationships to their surroundings. The 1600-acre tract of land provided to the Museum of Vertebrate Zoology of the University of California by Mrs. Hastings is near Jamesburg in the northern part of the Santa Lucia Mountains, Monterey County. The Pacific Ocean is less than 20 miles distant on the west, the distance to Point Sur being nearly 20 miles and that to Point Lobos about 25 miles; Point Lobos is 24 miles west and 8 miles north of the Reservation.

The Reservation contains parts of sections 4, 8, 9, 16, and 17, T 18 S, R 4 E, M.D.M., Jamesburg Quadrangle, Monterey County. The lines $36^{\circ} 23' N$ lat. and $121^{\circ} 33' W$ long. meet on the Reservation not far from the headquarters where observations and collections have been most concentrated. The site lies on the upper border of an area of grassland, being included in the drainage of the Carmel River though not in the immediate vicinity of that stream. Altitudinally the Reservation extends from about 1500 feet up to around 2750 feet.

Nearness to the sea ordinarily would give the site a coastal climate, but a high range of mountains intervenes. This cuts off much of the ocean's effect. Proximity to the sea does affect the site by stabilizing the temperature, increasing the rainfall, tempering the aridity of the summer, and reducing the evaporation. Only a few miles farther inland this influence is lost and in general character the land is much more like the desert. The summer fog blanket rarely reaches the Reservation, but fog distinctly affects the weather there. High ridges protect the site from the characteristic, strong winds of the region.

The aim to protect the soil, the plants, and the animals on the area is for the purpose of discovering and recording how all the plants and animals can maintain their species. This involves also

the detection and tracing of the multitude of responses that are made between organisms as well as between organisms and the environment. For this reason we need suitable names for the plants.

One of the first undertakings was to collect and preserve specimens of the kinds of plants that occur within the boundaries of the Reservation. Collections were made of the fungi, lichens, liverworts, mosses, ferns, and flowering plants. The ferns and flowering plants have been given the most attention. The herbarium of these higher plants consists of 3138 mounted specimens on standard sheets and represents 586 kinds. We have assembled a separate collection of seeds that represents most of the species. A major undertaking in recent years was the preparation of a collection of samples of leaves of the plants cleared, stained, and mounted on microscope slides. This part of the collection provides materials for the identification of fragments of leaves, and especially the small pieces of food obtained from the digestive tracts or droppings of birds and mammals. For each species a photomicrograph was made which shows many of the leaf structures.

The numbers in this list serve as codes, for the species and families, for the sorting of the plants by means of Uni-sort cards used in identifying the leaf characteristics.

The persons listed below have taken part in the collecting of plant specimens, in the microtechnical preparations, and in the curatorial work required in the establishment and maintenance of the collection: Janet F. Cahoon, Lydia J. Cahoon, Sunny Cook, Wilma Cook, Floyd E. Durham, Gretchen Graves, John A. Gray, Henry A. Hjersman, Art Holman, John Thomas Howell, Beatrice F. Howitt, Enid A. Larson, Mary Ann Linsdale, Jean M. Linsdale, Thomas Morley, Florence Morrow, G. Thomas Robbins, G. Ledyard Stebbins, Jr., Lloyd P. Tevis, Jr., P. Quentin Tomich, and Josephine Zane.

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LIST OF PLANTS

PTERIDOPHYTA

1. POLYPODIACEAE

1. *CYSTOPTERIS FRAGILIS* (Linnaeus) Bernhardt. Bladder Fern.
2. *DRYOPTERIS ARGUTA* (Kaulfuss) Watt. California Wood Fern.
3. *POLYSTICHUM MUNITUM* (Kaulfuss) Presl. Sword Fern.
4. *WOODWARDIA FIMBRIATA* J. E. Smith. Chain Fern.
5. *POLYPODIUM CALIFORNICUM* Kaulfuss. California Polypody.
6. *PITYROGRAMMA TRIANGULARIS* (Kaulfuss) Maxon. Goldback Fern.
7. *ADIANTUM JORDANII* C. Mueller. California Maidenhair.
8. *PTERIDIUM AQUILINUM* (Linnaeus) Kuhn var. *PUBESCENS* Underwood.
Bracken.
9. *PELLAEA ANDROMEDAEOFOLIA* (Kaulfuss) Fée. Coffee Fern.
10. *PELLAEA MUCRONATA* (D. C. Eaton) D. C. Eaton. Bird's-foot Fern.

2. EQUISETACEAE

11. *EQUISETUM TELMATEIA* Ehrhart var. *BRAUNII* (Milde) Milde. Giant Horsetail.
12. *EQUISETUM FUNSTONII* A. A. Eaton. California Scouring-rush.
13. *EQUISETUM HYEMALE* Linnaeus var. *ROBUSTUM* (A. Braun) A. A. Eaton.
Giant Scouring-rush.

3. SALVINIACEAE

14. *AZOLLA FILICULOIDES* Lamarck. Duckweed Fern.

4. SELAGINELLACEAE

15. *SELAGINELLA BIGELOVII* Underwood. Bigelow Moss-fern.

SPERMATOPHYTA

5. PINACEAE

16. *PINUS PONDEROSA* Douglas. Yellow Pine.
17. *PINUS COULTERI* D. Don. Coulter Pine.

6. TYPHACEAE

18. *TYPHA DOMINGENSIS* Persoon. Cat-tail.

7. GRAMINEAE

19. *BROMUS CARINATUS* Hooker & Arnott. California Bromegrass.
20. *BROMUS GRANDIS* (Shear) Hitchcock.
BROMUS GRANDIS (Shear) Hitchcock \times *BROMUS LAEVIPIES* Shear.
21. *BROMUS LAEVIPIES* Shear. Woodland Bromegrass.
22. *BROMUS MOLLIS* Linnaeus. Soft Chess.
23. *BROMUS ARENARIUS* Labillardière. Australian Chess.
24. *BROMUS RIGIDUS* Roth. Ripgutgrass.
25. *BROMUS RUBENS* Linnaeus. Red Brome.
26. *BROMUS MADRITENSIS* Linnaeus.
27. *FESTUCA OCTOFLORA* Walter. Six-weeks Fescue.
28. *FESTUCA MEGALURA* Nuttall. Foxtail Fescue.
29. *FESTUCA DERTONENSIS* (Allioni) Ascherson & Graebner.

30. *FESTUCA MYUROS* Linnaeus. Rat-tail Fescue.
31. *FESTUCA PACIFICA* Piper. Pacific Fescue.
32. *FESTUCA CONFUSA* Piper. Hairy-leaved Fescue.
33. *FESTUCA REFLEXA* Buckley. Few-flowered Fescue.
34. *FESTUCA ELMERI* Scribner & Merrill.
35. *POA ANNUA* Linnaeus. Annual Bluegrass.
36. *POA HOWELLII* Vasey & Scribner. Howell Bluegrass.
37. *POA PRATENSIS* Linnaeus. Kentucky Bluegrass.
38. *POA SCABRELLA* (Thurber) Bentham. Malpais Bluegrass.
39. *BRIZA MINOR* Linnaeus. Little Quakinggrass.
40. *DISTICHLIS SPICATA* (Linnaeus) Greene. Saltgrass.
41. *LAMARCKIA AUREA* (Linnaeus) Moench. Golden-top.
42. *MELICA IMPERFECTA* Trinius. California Melic.
43. *MELICA CALIFORNICA* Scribner. Western Melic.
44. *AGROPYRON DESERTORUM* (Fischer) Schultes. Crested Wheatgrass.
45. *AGROPYRON ARIZONICUM* Scribner & Smith var. *LAEVE* Scribner & Smith.
AGROPYRON ARIZONICUM Scribner & Smith \times *SITANION JUBATUM*
 J. G. Smith.
AGROPYRON ARIZONICUM Scribner & Smith \times *SITANION JUBATUM*
46. *ELYMUS TRITICOIDES* Buckley. Beardless Wild-rye.
47. *ELYMUS CONDENSATUS* Presl. Giant Ryegrass.
48. *ELYMUS GLAUCUS* Buckley. Western Ryegrass.
ELYMUS GLAUCUS Buckley \times *SITANION JUBATUM* J. G. Smith
 = *SITANION HANSENI* (Scribner) J. G. Smith.
49. *SITANION JUBATUM* J. G. Smith. Big Squirreltail.
50. *HORDEUM CALIFORNICUM* Covas. Meadow Barley.
51. *HORDEUM HYSTRIX* Roth. Mediterranean Barley.
52. *HORDEUM LEPORINUM* Link. Barnyard Foxtail.
53. *HORDEUM STEBBINSII* Covas. Stebbins Barley.
54. *HORDEUM VULGARE* Linnaeus. Barley.
55. *LOLIUM PERENNE* Linnaeus. Perennial Ryegrass.
56. *LOLIUM MULTIFLORUM* Lamarck. Italian Ryegrass.
57. *LOLIUM TEMULENTUM* Linnaeus. Darnel.
58. *SCHISMUS BARBATUS* (Linnaeus) Thellung.
59. *KOELERIA CRISTATA* (Linnaeus) Persoon. Junegrass.
60. *TRisetum CANESCENS* Buckley.
61. *DESCHAMPSIA DANTHONIOIDES* (Trinius) Munro.
62. *DESCHAMPSIA ELONGATA* (Hooker) Munro. Slender Hairgrass.
63. *AIRA CARYOPHYLLEA* Linnaeus. Silver Hairgrass.
64. *AVENA FATUA* Linnaeus. Wild Oat.
65. *AVENA BARBATA* Brotero. Slender Oat.
66. *AVENA SATIVA* Linnaeus. Cultivated Oat.
67. *CALAMAGROSTIS RUBESCENS* Buckley. Reedgrass.
68. *AGROSTIS SEMIVERTICILLATA* (Forskål) C. Christensen. Water Bentgrass.
69. *AGROSTIS EXARATA* Trinius. Western Bentgrass.
70. *AGROSTIS EXARATA* Trinius var. *PACIFICA* Vasey.
71. *POLYPOGON MONSPELIENSIS* (Linnaeus) Desfontaines. Beardgrass.
72. *POLYPOGON INTERRUPTUS* Humboldt, Bonpland & Kunth. Ditch Poly-
 pogon.
73. *GASTRIDIVM VENTRICOSUM* (Gouan) Schinz & Thellung. Nitgrass.

74. *MUHLENBERGIA RIGENS* (Bentham) Hitchcock. Deergrass.
 75. *STIPA CORONATA* Thurber. Large Needlegrass.
 76. *STIPA PULCHRA* Hitchcock. Purple Needlegrass.
 77. *STIPA CERNUA* Stebbins & Love. Nodding Needlegrass.
 78. *STIPA LEPIDA* Hitchcock. Foothill Needlegrass.
 79. *CYNODON DACTYLON* (Linnaeus) Persoon. Bermudagrass.
 80. *PHALARIS PARADOXA* Linnaeus. Gnawed Canarygrass.
 81. *PHALARIS MINOR* Retzius. Smaller Canarygrass.
 82. *ECHINOCHLOA CRUS-GALLI* (Linnaeus) Beauvois. Watergrass.

8. CYPERACEAE

83. *ELEOCHARIS MACROSTACHYA* Britton. Creeping Spikerush.
 84. *SCIRPUS CERNUUS* Vahl. Slender Clubrush.
 85. *SCIRPUS MICROCARPUS* Presl. Panicked Bulrush.
 86. *CAREX ALMA* Bailey.
 87. *CAREX LEPTOPODA* Mackenzie.
 88. *CAREX BOLANDERI* Olney. Wood Sedge.
 89. *CAREX GLOBOSA* Boott.
 90. *CAREX SERRATODENS* W. Boott. Bifid Sedge.
 91. *CAREX BARBARAE* Dewey. Santa Barbara Sedge.

9. LEMNACEAE

92. *LEMNA MINOR* Linnaeus. Smaller Duckweed.

10. JUNCACEAE

93. *JUNCUS EFFUSUS* Linnaeus. Bog Rush.
 94. *JUNCUS PATENS* E. Meyer. Common Rush.
 95. *JUNCUS MEXICANUS* Willdenow. Mexican Rush.
 96. *JUNCUS BALTICUS* Willdenow. Wire Rush.
 97. *JUNCUS OCCIDENTALIS* (Coville) Wiegand. Western Rush.
 98. *JUNCUS BUFONIUS* Linnaeus. Toad Rush.
 99. *JUNCUS RUGULOSUS* Engelman.
 100. *JUNCUS XIPHIODES* E. Meyer. Iris-leaved Rush.
 101. *LUZULA MULTIFLORA* (Retzius) Lejeune. Common Woodrush.

11. LILIACEAE

102. *CHLOROGALUM POMERIDIANUM* (De Candolle) Kunth. Soaproot.
 103. *ALLIUM PENINSULARE* Lemmon. Wild Onion.
 104. *BLOOMERIA CROCEA* (Torrey) Coville. Golden Bloomeria.
 105. *BRODIAEA IXIODES* (Aiton f.) Watson. Golden Brodiaea.
 106. *BRODIAEA PULCHELLA* (Salisbury) Greene. Blue Dicks.
 107. *BRODIAEA LAXA* (Bentham) Watson. Triteleia.
 108. *BRODIAEA JOLONENSIS* Eastwood. Jolon Brodiaea.
 109. *FRITILLARIA LANCEOLATA* Pursh. Checker Lily.
 110. *CALOCHORTUS ALBUS* (Bentham) Douglas. White Globe Lily.
 111. *CALOCHORTUS SPLENDENS* Douglas. Lilac Mariposa.
 112. *CALOCHORTUS LUTEUS* Douglas. Yellow Mariposa.
 113. *SMILACINA SESSILIFOLIA* (Baker) Nuttall. Slim Solomon.

12. IRIDACEAE

114. *SISYRINCHIUM BELLUM* Watson. Blue-eyed Grass.

13. ORCHIDACEAE

115. *HABENARIA ELEGANS* (Lindley) Bolander. Slender Rein-orchis.

14. SALICACEAE

116. *SALIX HINDSIANA* Benth. Sandbar Willow.
 117. *SALIX LASIOLEPIS* Benth. Arroyo Willow.
 118. *SALIX LASIOLEPIS* Benth. var. *BIGELOVII* (Torrey) Bebb.
 119. *SALIX LAEVIGATA* Bebb. Red Willow.
 120. *SALIX LAEVIGATA* Bebb. var. *ARAQUIPA* (Jepson) Ball.
 121. *POPULUS TRICHOCARPA* Torrey & Gray. Black Cottonwood.

15. BETULACEAE

122. *ALNUS RHOMBIFOLIA* Nuttall. White Alder.

16. FAGACEAE

123. *QUERCUS KELLOGGII* Newberry. California Black Oak.
 124. *QUERCUS AGRIFOLIA* Née. Coast Live Oak.
 QUERCUS AGRIFOLIA Née × *QUERCUS KELLOGGII* Newberry
 = *QUERCUS CHASEI* McMinn, Babcock, & Righter.
 125. *QUERCUS LOBATA* Née. Valley Oak.
 126. *QUERCUS DOUGLASHI* Hooker & Arnott. Blue Oak.
 127. *QUERCUS CHRYSOLEPIS* Liebmann. Maul Oak.

17. JUGLANDACEAE

128. *JUGLANS HINDSII* (Jepson) Jepson. California Black Walnut.

18. URTICACEAE

129. *URTICA HOLOSERICEA* Nuttall. Hoary Nettle.
 130. *URTICA URENS* Linnaeus. Small Nettle.

19. LORANTHACEAE

131. *PHORADENDRON VILLOSUM* Nuttall. Common Mistletoe.

20. POLYGONACEAE

132. *PTEROSTEGIA DRYMARIOIDES* Fischer & Meyer.
 133. *LASTARRIAEA CHILENSIS* Remy. Lastarriaea.
 134. *CHORIZANTHE STATICOIDES* Benth. Turkish Rugging.
 135. *CHORIZANTHE DOUGLASHI* Benth.
 136. *CHORIZANTHE MEMBRANACEA* Benth. Spine Flower.
 137. *ERIOGONUM ANGULOSUM* Benth. Angled-stemmed Eriogonum.
 138. *ERIOGONUM ELEGANS* Greene.
 139. *ERIOGONUM GRACILE* Benth.
 140. *ERIOGONUM NORTONII* Greene.
 141. *ERIOGONUM ELONGATUM* Benth.
 142. *ERIOGONUM NUDUM* Douglas. Tibinagua.
 143. *RUMEX CRISPUS* Linnaeus. Curly Dock.
 144. *RUMEX CONGLOMERATUS* Murray. Green Dock.
 145. *RUMEX SALICIFOLIUS* Weinmann var. *DENTICULATUS* Torrey. Willow Dock.
 146. *RUMEX PULCHER* Linnaeus.

147. RUMEX ACETOSELLA Linnaeus. Sheep Sorrel.
148. POLYGONUM AVICULARE Linnaeus. Wire Grass.

21. CHENOPODIACEAE

149. CHENOPODIUM MURALE Linnaeus. Nettle-leaf Goosefoot.
150. CHENOPODIUM ALBUM Linnaeus. White Goosefoot.
151. CHENOPODIUM AMBROSIODES Linnaeus. Mexican Tea.
152. CHENOPODIUM CALIFORNICUM Watson. Soap Plant.

22. AMARANTHACEAE

153. AMARANTHUS RETROFLEXUS Linnaeus. Rough Pigweed.
154. AMARANTHUS ALBUS Linnaeus. Tumbleweed.
155. AMARANTHUS GRAECIZANS Linnaeus. Prostrate Amaranth.

23. PORTULACACEAE

156. CALANDRINIA CILIATA (Ruiz & Pavon) De Candolle var. MENZIESII (Hooker) Macbride. Red Maids.
157. MONTIA FONTANA Linnaeus. Water Chickweed.
158. MONTIA PERFOLIATA (Donn) Howell. Miner's Lettuce.
159. MONTIA SPATHULATA (Douglas) Howell. Pale Montia.
160. CALYPTRIDIMUM MONANDRUM Nuttall.
161. PORTULACA OLERACEA Linnaeus. Common Purslane.

24. CARYOPHYLLACEAE

162. STELLARIA MEDIA (Linnaeus) Cyrillo. Common Chickweed.
163. STELLARIA NITENS Nuttall. Shining Chickweed.
164. CERASTIUM GLOMERATUM Thuillier. Mouse-ear Chickweed.
165. SAGINA APETALA Arduino var. BARBATA Fenzl. Dwarf Pearlwort.
166. SAGINA OCCIDENTALIS Watson. Western Pearlwort.
167. ARENARIA DOUGLASII Fenzl.
168. ARENARIA CALIFORNICA (Gray) Brewer. California Sandwort.
169. SPERGULA ARVENSIS Linnaeus. Corn Spurry.
170. SPERGULARIA BOCCONII (Scheele) Foucaud. Sand Spurry.
171. SPERGULARIA RUBRA (Linnaeus) J. & C. Presl. Purple Sand Spurry.
172. POLYCARPON DEPRESSUM Nuttall. California Polycarp.
173. LOEFLINGIA SQUARROSA Nuttall.
174. SILENE ANTIRRHINA Linnaeus. Sticky Catchfly.
175. SILENE GALLICA Linnaeus. Windmill Pink.
176. SILENE VERECUNDA Watson. Coast Pink.

25. RANUNCULACEAE

177. AQUILEGIA FORMOSA Fischer var. TRUNCATA (Fischer & Meyer) Baker. Woodland Columbine.
178. DELPHINIUM DECORUM Fischer & Meyer. Woodland Larkspur.
179. DELPHINIUM CALIFORNICUM Torrey & Gray. Coast Larkspur.
180. DELPHINIUM PARRYI Gray.
181. CLEMATIS LIGUSTICIFOLIA Nuttall. Yerba de Chivato.
182. CLEMATIS LASIANTHA Nuttall. Pipe-stem.
183. RANUNCULUS CALIFORNICUS Benthham. California Buttercup.

184. *RANUNCULUS HEBECARPUS* Hooker & Arnott. Downy Buttercup.

185. *THALICTRUM POLYCARPUM* (Torrey) Watson. Foothill Meadow Rue.

26. BERBERIDACEAE

186. *BERBERIS PINNATA* Lagasca. California Barberry.

27. LAURACEAE

187. *UMBELLULARIA CALIFORNICA* (Hooker & Arnott) Nuttall. California Laurel.

28. PAPAVERACEAE

188. *PLATYSTEMON CALIFORNICUS* Bentham. Cream Cup.

189. *MECONELLA LINEARIS* (Bentham) Nelson & Macbride. Narrow-leaved Meconella.

190. *MECONELLA DENTICULATA* Greene. White Meconella.

191. *ESCHSCHOLZIA CALIFORNICA* Chamisso. California Poppy.

192. *ESCHSCHOLZIA CAESPITOSA* Bentham var. *HYPECOIDES* (Bentham) Gray. Slender California Poppy.

193. *STYLOMECON HETEROPHYLLA* (Bentham) G. Taylor. Wind Poppy.

194. *PAPAVER SOMNIFERUM* Linnaeus. Garden Poppy.

29. CRUCIFERAE

195. *THELYPODIUM LASIOPHYLLUM* (Hooker & Arnott) Greene. Cut-leaved Thelypodium.

196. *STREPTANTHUS GLANDULOSUS* Hooker. Jewel Flower.

197. *LEPIDIUM PERFOLIATUM* Linnaeus.

198. *LEPIDIUM NITIDUM* Nuttall. Common Peppergrass.

199. *LEPIDIUM PUBESCENS* Desvaux. Wayside Peppergrass.

200. *SISYMBRIUM OFFICINALE* (Linnaeus) Scopoli. Hedge Mustard.

201. *SISYMBRIUM ALTISSIMUM* Linnaeus. Tumbling Mustard.

202. *DESCURAINIA SOPHIA* (Linnaeus) Webb. Flixweed.

203. *DESCURAINIA PINNATA* (Walter) Britton subsp. *MENZIESII* (De Candolle) Detling. Tansy Mustard.

204. *BRASSICA KABER* (De Candolle) L. C. Wheeler.

205. *BRASSICA GENICULATA* (Desfontaines) J. Ball.

206. *BRASSICA NIGRA* (Linnaeus) Koch. Black Mustard.

207. *BRASSICA CAMPESTRIS* Linnaeus. Yellow Mustard.

208. *BARBAREA AMERICANA* Rydberg. Yellow Rocket.

209. *RAPHANUS SATIVUS* Linnaeus. Wild Radish.

210. *RORIPPA NASTURTIUM-AQUATICUM* (Linnaeus) Schinz & Thellung. Water Cress.

211. *CARDAMINE OLIGOSPERMA* Nuttall. Hill Cress.

212. *DENTARIA CALIFORNICA* Nuttall. Milkmaids.

213. *TROPIDOCARPUM GRACILE* Hooker. Dobie Pod.

214. *CAPELLA BURSA-PASTORIS* (Linnaeus) Medicus. Shepherd's Purse.

215. *ATHYSANUS PUSILLUS* (Hooker) Greene. Sandweed.

216. *THYSANOCARPUS CURVIPES* Hooker. Fringe Pod.

217. *THYSANOCARPUS ELEGANS* Fischer & Meyer. Lace Pod.

218. *THYSANOCARPUS LACINIATUS* Nuttall. Narrow-leaved Fringe Pod.

219. *ARABIS GLABRA* (Linnaeus) Bernhardt. Tower Mustard.

220. *ERYSIMUM CAPITATUM* (Douglas) Greene. Wallflower.

30. CRASSULACEAE

221. *TILLAEA AQUATICA* Linnaeus. Water Pygmyweed.
222. *TILLAEA ERECTA* Hooker & Arnott. Sand Pygmy.
223. *ECHVEERIA LAXA* Lindley. Rock Lettuce.

31. SAXIFRAGACEAE

224. *SAXIFRAGA CALIFORNICA* Greene. California Saxifrage.
225. *LITHOPHRAGMA HETEROPHYLLUM* (Hooker & Arnott) Torrey & Gray. Hill Star.
226. *LITHOPHRAGMA AFFINE* Gray. Woodland Star.
227. *RIBES GRACILLIMUM* Coville & Britton. Golden Currant.
228. *RIBES MALVACEUM* Smith. California Black Currant.
229. *RIBES DIVARICATUM* Douglas. Straggly Gooseberry.
230. *RIBES SERICEUM* Eastwood. Lucia Gooseberry.
231. *RIBES MENZIESII* Pursh. Canyon Gooseberry.
232. *RIBES CALIFORNICUM* Hooker & Arnott. Hillside Gooseberry.
233. *RIBES SPECIOSUM* Pursh. Garnet Gooseberry.

32. PLATANACEAE

234. *PLATANUS RACEMOSA* Nuttall. Western Sycamore.

33. ROSACEAE

235. *HOLODISCUS DISCOLOR* (Pursh) Maximowicz var. *FRANCISCANUS* (Rydberg) Jepson. Creambush.
236. *POTENTILLA GLANDULOSA* Lindley var. *WRANGELLIANA* (Fischer & Avellallement) Wolf. Sticky Cinquefoil.
237. *ALCHEMILLA OCCIDENTALIS* Nuttall. Lady's Mantle.
238. *SANGUISORBA MINOR* (Linnaeus) Scopoli. Burnet.
239. *ADENOSTOMA FASCICULATUM* Hooker & Arnott. Chamise.
240. *CERCOCARPUS BETULOIDES* Nuttall. Hardtack.
241. *RUBUS URSINUS* Chamisso & Schlectendal. California Blackberry.
242. *ROSA CALIFORNICA* Chamisso & Schlectendal. California Wild Rose.
243. *ROSA GYMNOCARPA* Nuttall. Wood Rose.
244. *PRUNUS DEMISSA* (Nuttall) Walpers. Western Chokecherry.
245. *PRUNUS ILICIFOLIA* (Nuttall) Walpers. Islay.
246. *OSMARONIA CERASIFORMIS* (Torrey & Gray) Greene. Oso Berry.
247. *PHOTINIA ARBUTIFOLIA* (Aiton) Lindley. Toyon.

34. LEGUMINOSAE

248. *THERMOPSIS MACROPHYLLA* Hooker & Arnott. False Lupine.
249. *LUPINUS DENSIFLORUS* Bentham. Gully Lupine.
250. *LUPINUS CONCINNUS* Agardh. Bajada Lupine.
251. *LUPINUS SUCCULENTUS* Douglas. Arroyo Lupine.
252. *LUPINUS HIRSUTISSIMUS* Bentham. Stinging Lupine.
253. *LUPINUS TRUNCATUS* Nuttall. Wood Lupine.
254. *LUPINUS NANUS* Douglas. Sky Lupine.
255. *LUPINUS MICRANTHUS* Douglas. Field Lupine.
256. *LUPINUS BICOLOR* Lindley. Dove Lupine.
257. *LUPINUS FORMOSUS* Greene var. *BRIDGESII* (Watson) Greene. Lunara Lupine.
258. *CYTISUS MONSPESSULANUS* Linnaeus. French Broom.

259. *MEDICAGO SATIVA* Linnaeus. Alfalfa.
 260. *MEDICAGO HISPIDA* Gaertner. Bur Clover,
 261. *MEDICAGO HISPIDA* Gaertner var. *APICULATA* (Willdenow) Burnat.
 262. *MEDICAGO HISPIDA* Gaertner var. *CONFINIS* (Koch) Burnat.
 263. *MELILOTUS ALBUS* Desrousseaux. White Melilot.
 264. *MELILOTUS INDICUS* (Linnaeus) Allioni. Yellow Melilot.
 265. *TRIFOLIUM DUBIUM* Sibthorp. Shamrock.
 266. *TRIFOLIUM BIFIDUM* Gray. Pinole Clover.
 267. *TRIFOLIUM GRACILENTUM* Torrey & Gray. Pin-point Clover.
 268. *TRIFOLIUM CILIOLATUM* Bentham. Tree Clover.
 269. *TRIFOLIUM REPENS* Linnaeus. White Clover.
 270. *TRIFOLIUM ALBOPURPUREUM* Torrey & Gray. Rancheria Clover.
 271. *TRIFOLIUM BARBIGERUM* Torrey. Colony Clover.
 272. *TRIFOLIUM MICRODON* Hooker & Arnott. Valparaiso Clover.
 273. *TRIFOLIUM MICROCEPHALUM* Pursh. Maiden Clover.
 274. *TRIFOLIUM WORMSKJOLDII* Lehmann. Cow Clover.
 275. *TRIFOLIUM OLIGANTHUM* Steudel. Lanky Clover.
 276. *TRIFOLIUM VARIEGATUM* Nuttall. White-tip Clover.
 277. *TRIFOLIUM VARIEGATUM* Nuttall var. *PAUCIFLORUM* (Nuttall) McDermott.
 278. *TRIFOLIUM TRIDENTATUM* Lindley. Tomcat Clover.
 279. *TRIFOLIUM OBTUSIFLORUM* Hooker. Creek Clover.
 280. *TRIFOLIUM AMPLECTENS* Torrey & Gray. Bladder Clover.
 281. *LOTUS LEUCOPHAeus* Greene. Chaparral Lotus.
 282. *LOTUS STRIGOSUS* (Nuttall) Greene. Bishop Lotus.
 283. *LOTUS SUBPINNATUS* Lagasca. Calf Lotus.
 284. *LOTUS PURSHIANUS* (Bentham) Clements & Clements. Spanish Clover.
 285. *LOTUS MICRANTHUS* Bentham. Hill Lotus.
 286. *LOTUS SCOPARIUS* (Nuttall) Ottley. Deerweed.
 287. *PSORALEA PHYSODES* Douglas. California Tea.
 288. *PSORALEA MACROSTACHYA* De Candolle. Leather Root.
 289. *PSORALEA ORBICULARIS* Lindley. Round-leaved Psoralea.
 290. *ROBINIA PSEUDO-ACACIA* Linnaeus. Black Locust.
 291. *ASTRAGALUS DOUGLASII* (Torrey & Gray) Gray. Dobie Loco.
 292. *ASTRAGALUS GAMBELLIANUS* Sheldon. Little Bill Loco.
 293. *VICIA SATIVA* Linnaeus. Common Vetch.
 294. *VICIA ANGUSTIFOLIA* (Linnaeus) Reichenbach.
 295. *VICIA EXIGUA* Nuttall. California Vetch.
 296. *VICIA AMERICANA* Muhlenberg subsp. *OREGANA* (Nuttall) Abrams. American Vetch.
 297. *VICIA AMERICANA* Muhlenberg var. *LINEARIS* (Nuttall) Watson.
 298. *VICIA VILLOSA* Roth. Hairy Vetch.
 299. *VICIA DASYCARPA* Tenore.
 300. *LATHYRUS WATSONII* White. Buff Pea.
 301. *LATHYRUS BOLANDERI* Watson. Bolander Pea.
 302. *PISUM SATIVUM* Linnaeus var. *ARVENSE* (Linnaeus) Poir.

35. GERANIACEAE

303. *GERANIUM DISSECTUM* Linnaeus. Common Geranium.
 304. *ERODIUM MACROPHYLLUM* Hooker & Arnott var. *CALIFORNICUM* (Greene) Jepson.
 305. *ERODIUM BOTRYS* (Cavanilles) Bertoloni. Prostrate Stork's-bill.

306. *ERODIUM MOSCHATUM* (Linnaeus) L'Héritier de Brutelle. White-stem Filaree.

307. *ERODIUM CICUTARIUM* (Linnaeus) L'Héritier de Brutelle. Red-stem Filaree.

36. ZYGOPHYLLACEAE

308. *TRIBULUS TERRESTRIS* Linnaeus. Puncture Weed.

37. EUPHORBIACEAE

309. *EREMOCARPUS SETIGERUS* (Hooker) Bentham. Turkey Mullein.

310. *EUPHORBIA SPATHULATA* Lamarck. Reticulate-seeded Spurge.

311. *EUPHORBIA PEPLUS* Linnaeus. Petty Spurge.

312. *EUPHORBIA CRENULATA* Engelman. Chinese Caps.

313. *EUPHORBIA SERPYLLIFOLIA* Persoon var. *HIRTULA* (Engelman) L. C. Wheeler. Pine Spurge.

38. ANACARDIACEAE

314. *RHUS DIVERSILOBA* Torrey & Gray. Poison Oak.

39. ACERACEAE

315. *ACER MACROPHYLLUM* Pursh. Big-leaf Maple.

40. HIPPOCASTANACEAE

316. *AESCULUS CALIFORNICA* (Spach) Nuttall. Buckeye.

41. RHAMNACEAE

317. *RHAMNUS CALIFORNICA* Eschscholtz var. *TOMENTELLA* (Bentham) Brewer & Watson. Coffeeberry.

318. *RHAMNUS CROCEA* Nuttall var. *ILICIFOLIA* (Kellogg) Greene. Hollyleaf Redberry.

319. *CEANOOTHUS SOREDIATUS* Hooker & Arnott. Jimbrush.

320. *CEANOOTHUS RAMULOSUS* (Greene) McMinn. Coast Ceanothus.

42. MALVACEAE

321. *ABUTILON THEOPHRASTI* Medicus. Velvet Leaf.

322. *MALVA PARVIFLORA* Linnaeus. Cheeseweed.

43. CISTACEAE

323. *HELIANTHEMUM SCOPARIUM* Nuttall var. *VULGARE* Jepson. Rush-rose.

44. VIOLACEAE

324. *VIOLA PEDUNCULATA* Torrey & Gray. Yellow Pansy.

45. LOASACEAE

325. *MENTZELIA MICRANTHA* (Hooker & Arnott) Torrey & Gray. San Luis Stick-leaf.

46. DATISCEAE

326. *DATISCA GLOMERATA* (Presl) Baillon. Durango Root.

47. LYTHRACEAE

327. *LYTHRUM HYSSOPIFOLIA* Linnaeus. Grass Poly.

48. ONAGRACEAE

328. *ZAUSCHNERIA CALIFORNICA* Presl. California Fuchsia.
 329. *EPILOBIUM PANICULATUM* Nuttall. Summer Cottonweed.
 330. *EPILOBIUM FRANCISCANUM* Barbey. Coast Cottonweed.
 331. *BOISDUVALIA DENSIFLORA* (Lindley) Watson. Dense-flowered Boisduvalia.
 332. *CLARKIA ELEGANS* Douglas. Canyon Clarkia.
 333. *GODETIA CYLINDRICA* (Jepson) C. L. Hitchcock. Band Godetia.
 334. *GODETIA EPILOBIODES* (Nuttall) Watson. Canyon Godetia.
 335. *GODETIA QUADRIVULNERA* (Douglas) Spach. Four Spot.
 336. *OENOTHERA GRACILIFLORA* Hooker & Arnott. Hill Sun-cup.
 337. *OENOTHERA CONTORTA* Douglas.
 338. *OENOTHERA MICRANTHA* Hornemann.
 339. *OENOTHERA MICRANTHA* Hornemann var. *JONESII* Munz.
 340. *OENOTHERA MICRANTHA* Hornemann var. *IGNOTA* Jepson.

49. ARALIACEAE

341. *ARALIA CALIFORNICA* Watson. Elk Clover.

50. UMBELLIFERAE

342. *BOWLESIA INCANA* Ruiz & Pavon.
 343. *SANICULA CRASSICAULIS* Poeppig. Gambleweed.
 344. *SANICULA BIPINNATIFIDA* Douglas. Purple Sanicle.
 345. *SANICULA BIPINNATA* Hooker & Arnott. Poison Sanicle.
 346. *SANICULA TUBEROSA* Torrey. Turkey Pea.
 347. *APIASTRUM ANGUSTIFOLIUM* Nuttall. Mock Parsley.
 348. *CAUCALIS MICROCARPA* Hooker & Arnott. Western Hedge-parsley.
 349. *TORILIS NODOSA* (Linnaeus) Gaertner. Knotted Hedge-parsley.
 350. *OSMORHIZA CHILENSIS* Hooker & Arnott. Wood Cicely.
 351. *OSMORHIZA BRACHYPODA* Torrey. California Cicely.
 352. *DAUCUS PUSILLUS* Michaux. Rattlesnakeweed.
 353. *CONIUM MACULATUM* Linnaeus. Poison Hemlock.
 354. *BERULA ERECTA* (Hudson) Coville. Water Parsnip.
 355. *TAUSCHIA HARTWEGII* (Gray) Macbride.
 356. *LOMATIUM UTRICULATUM* (Nuttall) Coulter & Rose. Bladder Parsnip.
 357. *LOMATIUM DASYCARPUM* (Torrey & Gray) Coulter & Rose. Lace Parsnip.

51. CORNACEAE

358. *CORNUS CALIFORNICA* C. A. Meyer. Creek Dogwood.

52. ERICACEAE

359. *ARBUTUS MENZIESII* Pursh. Madroño.
 360. *ARCTOSTAPHYLOS GLANDULOSA* Eastwood. Eastwood Manzanita.
 361. *ARCTOSTAPHYLOS CRUSTACEA* Eastwood.
 362. *ARCTOSTAPHYLOS BRACTEOSA* (De Candolle) Abrams.

53. PRIMULACEAE

363. *ANAGALLIS ARVENSIS* Linnaeus. Pimpernel.
 364. *DODECATHEON CLEVELANDII* Greene subsp. *SANCTARUM* (Greene) Abrams.
 Shooting Star.

54. ASCLEPIADACEAE

365. *ASCLEPIAS ERIOCARPA* Benth. Indian Milkweed.
366. *ASCLEPIAS FASCICULARIS* Decaisne. Narrow-leaf Milkweed.

55. CONVOLVULACEAE

367. *CONVOLVULUS SUBACAULIS* (Hooker & Arnott) Greene. Short-stemmed Morning-glory.
368. *CONVOLVULUS MALACOPHYLLUS* Greene subsp. *PEDICELLATUS* (Jepson) Abrams. Woolly Morning-glory.
369. *CONVOLVULUS ARVENSIS* Linnaeus. Bindweed.
370. *CUSCUTA CALIFORNICA* Choisy. Chaparral Dodder.
371. *CUSCUTA SUBINCLUSA* Durand & Hilgard. Long-flowered Dodder.

56. POLEMONIACEAE

372. *COLLOMIA GRANDIFLORA* Douglas.
373. *PHLOX GRACILIS* (Hooker) Greene. Annual Phlox.
374. *LINANTHUS PYGMAEUS* (Brand) J. T. Howell.
375. *LINANTHUS DICHOTOMUS* Benth. Evening Snow.
376. *LINANTHUS BIGELOVII* (Gray) Greene.
377. *LINANTHUS CILIATUS* (Bentham) Greene. Bristly-leaved Linanthus.
378. *LINANTHUS ANDROSACEUS* (Bentham) Greene. Shower Gilia.
379. *LINANTHUS ANDROSACEUS* (Bentham) Greene subsp. *MICRANTHUS* (Steudel) Mason.
380. *LINANTHUS BICOLOR* (Nuttall) Greene.
381. *ERIASTRUM DENSIFOLIUM* (Bentham) Mason.
382. *ERIASTRUM VIRGATUM* (Bentham) Mason. Monterey Gilia.
383. *NAVARRETIA MITRACARPA* Greene subsp. *JAREDI* (Eastwood) Mason.
384. *NAVARRETIA ATRACTYLOIDES* (Bentham) Hooker & Arnott.
385. *NAVARRETIA MELLITA* Greene.
386. *GILIA GILIOIDES* (Bentham) Greene. Straggling Gilia.
387. *GILIA ACHILLEAEFOLIA* Benth.
388. *GILIA MULTICAULIS* Benth.
389. *GILIA MULTICAULIS* Bentham subsp. *PEDUNCULARIS* (Eastwood) Mason & Grant.
390. *GILIA TENUIFLORA* Benth.

57. HYDROPHYLLACEAE

391. *PHOLISTOMA AURITUM* (Lindley) Lilja. Fiesta-flower.
392. *PHOLISTOMA MEMBRANACEUM* (Bentham) Constance. White Fiesta-flower.
393. *NEMOPHILA MENZIESII* Hooker & Arnott. Baby Blue-eyes.
394. *NEMOPHILA PEDUNCULATA* Douglas. Spreading Nemophila.
395. *NEMOPHILA PARVIFLORA* Douglas. Small-flowered Nemophila.
396. *NEMOPHILA PULCHELLA* Eastwood var. *FREMONTII* (Elmer) Constance.
397. *PHACELIA RAMOSISSIMA* Douglas. Long-branched Phacelia.
398. *PHACELIA DISTANS* Benth. Wild Heliotrope.
399. *PHACELIA MALVAEFOLIA* Chamisso. Stinging Phacelia.
400. *PHACELIA CILIATA* Benth. Field Phacelia.
401. *PHACELIA STIMULANS* Eastwood.
402. *PHACELIA DOUGLASHII* (Bentham) Torrey.
403. *PHACELIA BRACHYLOBA* (Bentham) Gray. Short-lobed Phacelia.

404. EMMENANTHE PENDULIFLORA Benth. Whispering Bells.
 405. ERIODICTYON CALIFORNICUM (Hooker & Arnott) Torrey. Yerba Santa.
 406. ERIODICTYON TOMENTOSUM Benth. Woolly Yerba Santa.

58. BORAGINACEAE

407. PECTOCARYA PENICILLATA (Hooker & Arnott) A. De Candolle. Winged Pectocarya.
 408. PECTOCARYA SETOSA Gray. Bristly Pectocarya.
 409. PECTOCARYA PUSILLA (A. De Candolle) Gray. Little Pectocarya.
 410. CYNOGLOSSUM GRANDE Douglas. Western Hound's Tongue.
 411. ALLOCARYA BRACTEATA Howell.
 412. ALLOCARYA TRACHYCARPA (Gray) Greene.
 413. ECHIDIOCARYA CALIFORNICA Gray.
 414. PLAGIOBOTHRYIS NOTHOFULVUS (Gray) Gray. Rusty Plagiobothrys.
 415. PLAGIOBOTHRYIS UNCINATUS J. T. Howell.
 416. PLAGIOBOTHRYIS CANESCENS Benth.
 417. PLAGIOBOTHRYIS TENELLUS (Nuttall) Gray. Slender Plagiobothrys.
 418. CRYPTANTHA RATTANII Greene.
 419. CRYPTANTHA NEVADENSIS Nelson & Kennedy var. RIGIDA Johnston.
 420. CRYPTANTHA MURICATA (Hooker & Arnott) Nelson & Macbride var. JONESII (Gray) Johnston.
 421. CRYPTANTHA CLEVELANDII Greene var. FLOROSA Johnston.
 422. CRYPTANTHA MICROSTACHYS Greene.
 423. CRYPTANTHA FLACCIDA (Douglas) Greene. Weak-stemmed Cryptantha.
 424. CRYPTANTHA SPARSIFLORA (Greene) Greene.
 425. AMSINCKIA INTERMEDIA Fischer & Meyer. Common Fiddleneck.
 426. AMSINCKIA RETRORSA Suksdorf. Rigid Fiddleneck.

59. VERBENACEAE

427. VERBENA LASIOSTACHYS Link. Common Vervain.

60. LABIATAE

428. TRICHOSTEMA LANCEOLATUM Benth. Vinegarweed.
 429. TRICHOSTEMA LANATUM Benth. California Romero.
 430. SCUTELLARIA TUBEROSA Benth. Skull-cap.
 431. MARRUBIUM VULGARE Linnaeus. Common Horehound.
 432. LAMIUM AMPLEXICAULE Linnaeus. Giraffe Head.
 433. STACHYS BULLATA Benth. Hedge Nettle.
 434. STACHYS PYCNANTHA Benth. Coast Stachys.
 435. SALVIA COLUMBARIÆ Benth. Chia.
 436. SALVIA MELLIFERA Greene. Black Sage.
 437. SATUREJA DOUGLASHI (Benth) Briquet. Yerba Buena.
 438. SATUREJA MIMULOIDES (Benth) Briquet.
 439. MONARDELLA VILLOSA Benth subsp. SUBSERRATA (Greene) Epling. Coyote Mint.
 440. MENTHA SPICATA Linnaeus. Spearmint.

61. SOLANACEAE

441. SOLANUM NODIFLORUM Jacquin. Small-flowered Nightshade.
 442. SOLANUM SARACHOIDES Sendtner. Hairy Nightshade.
 443. SOLANUM UMBELLIFERUM Eschscholtz. Blue Witch.

444. *DATURA METELOIDES* De Candolle. Tolguacha.
445. *DATURA STRAMONIUM* Linnaeus. Stramonium.
446. *NICOTIANA BIGELOVII* (Torrey) Watson. Indian Tobacco.

62. SCROPHULARIACEAE

447. *MIMULUS FLORIBUNDUS* Douglas.
448. *MIMULUS NASUTUS* Greene.
449. *MIMULUS GUTTATUS* Fischer. Common Monkey-flower.
450. *MIMULUS RATTANII* Gray.
451. *MIMULUS CONGDONII* Robinson.
452. *MIMULUS DOUGLASII* (Benth) Gray. Purple Mouse-ears.
453. *MIMULUS FREMONTII* (Benth) Gray.
454. *MIMULUS BOLANDERI* Gray. Tobacco Mimulus.
455. *DIPLACUS AURANTIACUS* (Curtis) Jepson. Northern Sticky Monkey-flower.
456. *DIPLACUS FASCICULATUS* (Pennell) McMinn. Santa Lucia Sticky Monkey-flower.
457. *PENSTEMON CENTRANTHIFOLIUS* Benth. Scarlet Bugler.
458. *PENSTEMON HETEROPHYLLUS* Lindley. Chaparral Penstemon.
459. *PENSTEMON BREVIFLORUS* Lindley. Bush Beard-tongue.
460. *SCROPHULARIA CALIFORNICA* Chamisso & Schlectendal. California Figwort.
461. *COLLINSIA HETEROPHYLLA* Buist. Chinese Houses.
462. *COLLINSIA SOLITARIA* Kellogg. Few-flowered Collinsia.
463. *COLLINSIA CHILDI* Parry.
464. *LINARIA TEXANA* Scheele. Toad Flax.
465. *ANTIRRHINUM MULTIFLORUM* Pennell. Sticky Snapdragon.
466. *ANTIRRHINUM HOOKERIANUM* Millspaugh. Lax Snapdragon.
467. *VERONICA PEREGRINA* Linnaeus. Purslane Speedwell.
468. *VERONICA PERSICA* Poir. Winter Speedwell.
469. *VERONICA ANAGALLIS-AQUATICA* Linnaeus. Water Speedwell.
470. *PEDICULARIS DENSIFLORA* Benth. Indian Warrior.
471. *ORTHOCARPUS DENSIFLORUS* Benth. Owl's Clover.
472. *ORTHOCARPUS PURPURASCENS* Benth. Escobita.
473. *ORTHOCARPUS ATTENUATUS* Gray. Valley Tassels.
474. *ORTHOCARPUS PUSILLUS* Benth. Dwarf Orthocarpus.
475. *CASTILLEJA DOUGLASII* Benth. Indian Paint-brush.
476. *CASTILLEJA FOLIOLOSA* Hooker & Arnott. Woolly Painted Cup.
477. *CORDYLANTHUS RIGIDUS* (Benth) Jepson. Bird's-beak.

63. OROBANCHACEAE

478. *OROBANCHE GRAYANA* G. Beck. Stout Broom-rape.
479. *OROBANCHE GRAYANA* G. Beck var. *JEPSONII* Munz.
480. *OROBANCHE BULBOSA* G. Beck.
481. *OROBANCHE UNIFLORA* Linnaeus. Naked Broom-rape.
482. *OROBANCHE FASCICULATA* Nuttall. Clustered Broom-rape.

64. PLANTAGINACEAE

483. *PLANTAGO MAJOR* Linnaeus. Common Plantain.
484. *PLANTAGO LANCEOLATA* Linnaeus. Ribwort.
485. *PLANTAGO INDICA* Linnaeus.
486. *PLANTAGO ERECTA* Moench.

65. RUBIACEAE

487. *GALIUM APARINE* Linnaeus. Goose Grass.
 488. *GALIUM NUTTALLII* Gray. Nuttall Bedstraw.
 489. *GALIUM CALIFORNICUM* Hooker & Arnott. California Bedstraw.
 490. *GALIUM ANGUSTIFOLIUM* Nuttall. Chaparral Bedstraw.

66. CAPRIFOLIACEAE

491. *SAMBUCUS COERULEA* Rafinesque. Blue Elderberry.
 492. *SYMPHORICARPOS RIVULARIS* Suksdorf. Snowberry.
 493. *SYMPHORICARPOS MOLLIS* Nuttall. Spreading Snowberry.
 494. *LONICERA INTERRUPTA* Bentham. Chaparral Honeysuckle.

67. VALERIANACEAE

495. *PLECTRITIS SAMOLIFOLIA* (De Candolle) Hoek var. *INVOLUTA* (Suksdorf) Dyal.
 496. *PLECTRITIS MACROCERA* Torrey & Gray var. *MAMILLATA* (Suksdorf) Dyal.
 497. *PLECTRITIS CILIOSA* (Greene) Jepson var. *DAVYANA* (Jepson) Dyal.
 498. *PLECTRITIS MAGNA* (Greene) Suksdorf.
 499. *PLECTRITIS MACROPTERA* (Suksdorf) Rydberg var. *PATELLIFORMIS* (Suksdorf) Dyal.

68. CUCURBITACEAE

500. *MARAH FABACEUS* (Naudin) Dunn. Common Manroot.

69. CAMPANULACEAE

501. *GITHOPSIS SPECULARIODES* Nuttall. Bluecup.
 502. *SPECULARIA BIFLORA* (Ruiz & Pavon) Fischer & Meyer. Venus Looking-glass.

70. LOBELIACEAE

503. *NEMACLADUS RAMOSISSIMUS* Nuttall.

71. COMPOSITAE

504. *BRICKELLIA CALIFORNICA* (Torrey & Gray) Gray. California Brickellbush.
 505. *CHRYSOPSIS VILLOSA* (Pursh) Nuttall var. *ECHIOIDES* (Bentham) Gray.
 Hairy Golden Aster.
 506. *SOLIDAGO CALIFORNICA* Nuttall. Common Golden Rod.
 507. *HAZARDIA SQUARROSA* (Hooker & Arnott) Greene. Sawtooth Goldenbush.
 508. *PENTACHAETA EXILIS* Gray.
 509. *PENTACHAETA ALSINOIDES* Greene.
 510. *LESSINGIA GERMANORUM* Chamisso var. *TENUIPES* J. T. Howell.
 511. *CORETHROGYNE FILAGINIFOLIA* (Hooker & Arnott) Nuttall. Cudweed Aster.
 512. *ASTER RADULINUS* Gray. Broad-leaf Aster.
 513. *ERIGERON FOLIOSUS* Nuttall.
 514. *ERIGERON CANADENSIS* Linnaeus. Horseweed.
 515. *ERIGERON CRISPUS* Pouttet.
 516. *ERIGERON PHILADELPHICUS* Linnaeus. Skevish.
 517. *BACCHARIS DOUGLASHI* De Candolle. Douglas Baccharis.
 518. *BACCHARIS VIMINEA* De Candolle. Mule Fat.
 519. *BACCHARIS PILULARIS* De Candolle var. *CONSANGUINEA* (De Candolle) Kuntze. Coyote Brush.
 520. *FILAGO CALIFORNICA* Nuttall. California Cotton Rose.

521. *FILAGO GALLICA* (Linnaeus) Linnaeus.
522. *EVAX SPARSIFLORA* (Gray) Jepson. Dwarf Evax.
523. *MICROPUS CALIFORNICUS* Fischer & Meyer. Slender Cottonweed.
MICROPUS CALIFORNICUS Fischer & Meyer \times *PSILOCARPHUS TENELLUS*
Nuttall.
524. *STYLOCLINE GNAPHALIOIDES* Nuttall.
525. *PSILOCARPHUS TENELLUS* Nuttall. Slender Woolly-heads.
526. *PSILOCARPHUS TENELLUS* Nuttall var. *TENUIS* (Eastwood) Cronquist.
527. *GNAPHALIUM PALUSTRE* Nuttall. Lowland Cudweed.
528. *GNAPHALIUM RAMOSISSIMUM* Nuttall. Pink Everlasting.
529. *GNAPHALIUM MICROCEPHALUM* Nuttall.
530. *GNAPHALIUM BENEOLENS* Davidson.
531. *GNAPHALIUM CHILENSE* Sprengel. Cotton-batting Plant.
532. *GNAPHALIUM LUTEO-ALBUM* Linnaeus.
533. *GNAPHALIUM CALIFORNICUM* De Candolle. California Everlasting.
534. *GNAPHALIUM PURPUREUM* Linnaeus. Purple Cudweed.
535. *XANTHIUM SPINOSUM* Linnaeus. Spiny Clotbur.
536. *WYETHIA HELENIODES* Nuttall. Woolly Mule-ears.
537. *HEMIZONIA LOBBII* Greene.
538. *HEMIZONIA CORYMBOSA* (De Candolle) Torrey & Gray. Coast Tarweed.
539. *CALYCADENIA TRUNCATA* De Candolle. Rosinweed.
540. *MADIA MADIOIDES* (Nuttall) Greene. Woodland Madia.
541. *MADIA ELEGANS* Don. Common Madia.
542. *MADIA SATIVA* Molina. Chile Tarweed.
543. *MADIA GRACILIS* (Smith) Keck. Gumweed.
544. *MADIA EXIGUA* (Smith) Greene. Little Tarweed.
545. *LAYIA PLATYGLOSSA* (Fischer & Meyer) Gray var. *BREVISETA* Gray.
546. *LAYIA HIERACIOIDES* (De Candolle) Hooker & Arnott.
547. *LAGOPHYLLA RAMOSISSIMA* Nuttall. Slender Rabbit-leaf.
548. *ACHYRACHAENA MOLLIS* Schauer. Blow-wives.
549. *BAERIA CHRYSOSTOMA* Fischer & Meyer. Gold-fields.
550. *MONOLOPIA MAJOR* De Candolle. Large-flowered Monolopia.
551. *ERIOPHYLLUM CONFERTIFLORUM* (De Candolle) Gray. Golden-yarrow.
552. *ERIOPHYLLUM CONFERTIFLORUM* (De Candolle) Gray var. *LAXIFLORUM*
Gray.
553. *RIGIOPAPPUS LEPTOCLADUS* Gray. Bristle-head.
554. *CHAENACTIS GLABRIUSCULA* De Candolle.
555. *HELENIUM PUBERULUM* De Candolle. Rosilla.
556. *ANTHEMIS COTULA* Linnaeus. Mayweed.
557. *ACHILLEA LANULOSA* Nuttall. Common Yarrow.
558. *MATRICARIA MATRICARIOIDES* (Lessing) Porter. Pineappleweed.
559. *SOLIVA DAUCIFOLIA* Nuttall.
560. *ARTEMISIA CALIFORNICA* Lessing. California Sagebrush.
561. *ARTEMISIA DRACUNCULOIDES* Pursh. Dragon Sagewort.
562. *ARTEMISIA DOUGLASIANA* Besser. California Mugwort.
563. *SENECIO BREWERI* Davy.
564. *SENECIO VULGARIS* Linnaeus. Common Groundsel.
565. *CIRSIUM VULGARE* (Savi) Tenore. Bull Thistle.
566. *CIRSIUM QUERCETORUM* (Gray) Jepson. Brownie Thistle.
567. *CIRSIUM COULTERI* Harvey & Gray. Western Thistle.

568. *SILYBUM MARIANUM* (Linnaeus) Gaertner. Milk Thistle.
 569. *CENTAUREA MELITENSIS* Linnaeus. Napa Thistle.
 570. *MICROSERIS APHANTOCARPHA* (Gray) Gray.
 571. *MICROSERIS DOUGLASHI* (De Candolle) Gray. Silver Puffs.
 572. *UROPAPPUS LINDLEYI* (De Candolle) Nuttall.
 573. *UROPAPPUS LINEARIFOLIUS* (De Candolle) Nuttall.
 574. *HYPOCHOERIS GLABRA* Linnaeus. Smooth Cat's-ear.
 575. *STEPHANOMERIA VIRGATA* Bentham. Tall Stephanomeria.
 576. *RAFINESQUIA CALIFORNICA* Nuttall.
 577. *MALACOTHRIX CLEVELANDII* Gray.
 578. *MALACOTHRIX FLOCCIFERA* (De Candolle) Blake.
 579. *TARAXACUM OFFICINALE* Weber. Dandelion.
 580. *SONCHUS OLERACEUS* Linnaeus. Common Sow-thistle.
 581. *SONCHUS ASPER* (Linnaeus) Hill. Prickly Sow-thistle.
 582. *LACTUCA SERRIOLA* Linnaeus. Prickly Lettuce.
 583. *AGOSERIS GRANDIFLORA* (Nuttall) Greene.
 584. *AGOSERIS RETRORSA* (Bentham) Greene.
 585. *AGOSERIS HETEROPHYLLA* (Nuttall) Greene var. *CALIFORNICA* (Nuttall) Jepson.
 586. *HIERACIUM ARGUTUM* Nuttall var. *PARISHII* (Gray) Jepson.

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SCRIBNERIA IN CALIFORNIA

BY BEECHER CRAMPTON

University of California, Davis

Scribneria Bolanderi (Thurb.) Hack., the only species, is native to the Pacific Coast, ranging from Washington south through Oregon and into California. Relative to California, floras ascribe to this plant a rare or limited occurrence on sandy or sterile ground. The numerous collections of *Scribneria* in northern California herbaria, as well as the author's experience in the collection of this grass, necessitate revision of this concept. One hundred two different California collections were examined in the following herbaria: Agronomy Herbarium, University of California, Davis, 23; California Academy of Sciences, 41; University of California, Berkeley, 30; and Dudley Herbarium, Stanford University, 8.

Summarily, the distribution is as follows: 100 to 9000 feet elevation, the habitat variable; Siskiyou and Modoc counties, south through the Sierra Nevada to Tulare County, through the Great Valley to Fresno County, and through the Coast Ranges to San Luis Obispo County. No plants seen were collected in Trinity or Del Norte counties or south of San Luis Obispo County. The author has repeatedly found the grass in the Sacramento Valley and North Coast Ranges, and J. T. Howell and P. H. Raven similarly in the Sierra Nevada.

The grass is remarkable for its diversity of habitat. High montane collections indicate the plant as growing in seepages on or adjacent to granitic rocks or slopes. Collections from the forested middle elevations indicate habitats more variable, such as lava flats, ridges, openings in conifer forest, roadside sand or gravel, and rock crevices. At the lower elevations the grass grows on rocky slopes, in serpentine and other soils at the edge of or in clearings of chaparral, in decomposed rock and rubble which may be volcanic or otherwise, on edges of mineral springs, in roadside gravels, and in vernal pools. In the Great Valley, *Scribneria* is found in depressions or on edges of vernal pools, in moist swales of rolling plains, and often in beds of dry creeks.

The spikes do not disintegrate readily and often persist long after maturity, allowing recognizable identity from spring to late in the year. Hence, the grass is not of short duration, even though relatively inconspicuous in habit. It must be conceded the plant is not at all rare and enjoys a wide distribution of numerous habitats in California.

Variations from the description of *Scribneria* have been seen in some collections of the grass. Normally, a single or several slender culms are produced terminating in narrow, attenuate spikes. Some variation occurs by renewed growth, probably from changing moisture conditions, which produces a dense tufting at the base with the development of numerous short spikes.

The number of spikelets is also quite variable, from one at a node in small plants to as many as three or even four at a node in robust plants. Very commonly at the base of the spike there are two spikelets at a node, one sessile, the other pedicelled or subsessile, while above the singular condition prevails. Two of the author's collections (*Crampton 1116, 1442*) have commonly 3 or 4 spikelets at a node (1 sessile, 1 subsessile, and 1 or 2 pedicelled) on lower part of the spikes, decreasing to two spikelets at a node and finally to a singular condition at the apex. On shorter culms the basal portion of the spike is often included within the leaf-sheaths with consequent development of cleistogamous spikelets.

A NEW VARIETY OF STIPA LEMMONI

BY BEECHER CRAMPTON

University of California, Davis

Stipa Lemmoni (Vasey) Scribn. var. **pubescens** Crampton, var. nov. Speciei similis sed foliis (et laminis et vaginis) pubescentibus.

Similar to the species but the blades and sheaths entirely pubescent.

CALIFORNIA: serpentine slopes in chaparral, Whitlock Camp-Round Mountain area west of Paskenta, Tehama County, elevation about 4000 feet, June 16, 1954, *Crampton 2000* (type, Agronomy Herbarium, University of California, Davis; isotype, United States National Herbarium). WASHINGTON: on dry ground in open forest at Bingen, May 27 and June 14, 1916, *Wilhelm Suksdorf 8661* (University of California, Berkeley; Dudley Herbarium, Stanford University; California Academy of Sciences; U. S. National Herbarium).

The dense, short pubescence on the sheaths and both surfaces of the blades readily identifies this variety. The only two known localities are cited above. Suksdorf gave a manuscript name to his Bingen collection but did not publish it.

The type locality represents a transition from chaparral to ponderosa pine forest. To the west of the type region in the ponderosa pine forest typical *S. Lemmoni* is abundant above 4500 feet elevation.

A NEW SPECIES AND NEW VARIETY OF
MIMULUS FROM NEVADA

BY GABRIEL EDWIN

Beltsville, Maryland

Mimulus washoensis Edwin, spec. nov. Annuus; caulis erectus, glanduloso-pubescent; folia sessilia, lanceolata, lanceolato-linearia, elliptica vel aliquando obovata, usque ad 1.8 cm. longa, 3-6 (8) mm. lata; pedicelli 2-4 mm. longi; calyx ovatus vel campanulatus, 0.8-1.1 cm. longus, nervis maturitate rubris dentibusque ciliatis, lobis subaequalibus raro aequalibus; corollae tubus usque ad 2.5 cm. longus, flavus sicco brunnescens purpureo-maculatus; antherae exsertae margine superiore ciliatae; stigmatis lobi aequilongi, fimbriati; placentae per totam longitudinem dehiscentes; semina ellipsoidea.

Annual; stem upright, unbranched, up to 10 cm. high, glandular-pubescent; leaves lanceolate, lance-linear, or elliptic, occasionally obovate, sessile, entire or nearly so, up to 1.8 cm. long, 3-6 (8) mm. wide, ciliate; pedicels shorter than the subtending leaves, 2-4 mm. long, pubescent or glandular-pubescent; calyx 0.8-1.1 cm. long, filled by the capsule (but not expanded), ovate to somewhat campanulate, pubescent, veins red at maturity, the teeth 2-3 mm. long, acute, ciliate, subequal or rarely equal; corolla up to 2.5 cm. long, withering in place, tube well exserted, yellow, drying brown, with 2 densely hairy ridges inside, lobes broadly expanding, equal or almost so, yellow, dotted and striped with purple; upper pair of stamens exserted, only a little shorter than the style, filaments crossing at apex, anthers with a row of cilia along the upper margins, filaments glabrous; style pubescent with white hairs over most of its length, stigma-lips ovate, fimbriate, equal; capsule little exceeding the calyx at maturity, lance-ovate, dehiscent along the inner suture, placentae splitting their entire length, adhering to the valves; seeds numerous, smooth, shiny, ellipsoid, apiculate at one or both ends.

Type: *P. A. Lehanbauer 1906*, Pyramid Road, Washoe County, Nevada, May 29, 1925 (University of Nevada Herbarium No. 15640).

Belonging to the subgenus *Schizoplacus* Grant, section *Eunanus* Gray, this species is most closely related to *Mimulus coccineus* Congd. and *M. stamineus* Grant. It differs from the former by its sessile leaves, exserted stamens, subequal calyx-teeth, shorter corolla-tube in relation to the calyx, and in capsule shape; from the latter in the shape of the corolla-lobes and capsule, and in the less exserted stamens with retrorse hairs at the base of the longer filaments; from both in the larger flowers with longer calyx and corolla, ciliate calyx-teeth, flower color (yellow as opposed to mostly reddish-purple), anthers with a row of cilia across the margin, longer pedicels, and shape of the seeds.

Mimulus spissus Grant var. *lincolnensis* Edwin, nov. var. Differt a forma typica foliis lanceolato-ovatis vel ellipticis saepissime brevissime petiolatis, dentibus calycis brevioribus, et lobis stigmatibus aequalibus eciliatis.

Differing from typical *M. spissus* Grant through the lance-ovate or elliptical, mostly very short-petioled leaves, smaller, equal calyx-teeth, and eciliate stigma-lobes.

Type: *H. D. Ripley & R. C. Barneby 3472*, on rocky slopes of both igneous and calcareous formations, Hiko, Lincoln County, Nevada, May 19, 1941; the purple- and yellow-flowered forms growing together but the latter form more abundant (California Academy of Sciences Herbarium No. 318315).

National Arboretum Herbarium
U. S. Department of Agriculture
Beltsville, Maryland

THE OTIS MANNA-GRASS

BY C. LEO HITCHCOCK

University of Washington, Seattle

When A. S. Hitchcock (*Am. Jour. Bot.* 21: 128,—1934) described *Glyceria Otisii* he ventured the opinion that it was allied to *G. elata* (Nash) Hitchc., but stated that it differed therefrom "in the broader oblong spikelets, with, on the average, more florets, the broader glumes and lemmas, especially at the summit, the very scabrous lemmas, and the prominent hyaline minutely ciliate erose-dentate tip contrasting with the purple zone below, the other part of the lemma being green." The type, *T. C. Otis 1548*, was collected "in a small creek near mile 15 on trail to Hoh, Jefferson County, Washington, alt. 100 meters, July 10, 1927."

In the *Manual of Grasses of the United States* (p. 92,—1935), it was treated merely as "resembling *G. elata*; spikelets broader, oblong, with on the average more florets, the glumes broader; lemmas broader, especially at the summit, very scabrous, the prominent hyaline tip contrasting with the purple zone just below, the lower part of the lemma green."

The type-collection of *G. Otisii* in the University of Washington Herbarium is much more similar to *G. pauciflora* Presl, having, in common with that plant such important characteristics as open sheaths, broad erose lemmas that are scabrous or scaberulous and with a narrow purplish zone below the hyaline tip, and number of flowers in each spikelet. Hitchcock's empha-

sis upon the large number of florets, "on the average more florets" than *G. elata*, a species which he described as having 6 to 8, seems to have been an error as the illustration of *G. Otisii* in the Grass Manual and our isotype have about 6. However, the Otis collection has lemmas with 7 nerves of comparatively equal prominence, whereas the lemmas of *G. pauciflora* are usually more accurately described as 5-nerved, since the marginal pair generally are less prominent than the other five. The relationship of these two taxa was well emphasized by Church (Am. Jour. Bot. 36: 163,—1949) when he transferred *G. Otisii* to the new genus *Torreyochloa* [type-species, *T. pauciflora* (Presl) Church] as *T. Otisii* (Hitchc.) Church.

It is my impression that several botanists have tried, unsuccessfully, to recollect *G. Otisii*, although I find in the University of Washington Herbarium only two collections of *Glyceria* from the western part of the Olympic Peninsula, aside from Otis's plant.

One of my former students, Mrs. Elizabeth Fletcher Barlowe, mentioned to me a number of years ago that her father, Mr. Fred Fletcher, had known Mr. Otis and knew the spot where he collected the type of *G. Otisii*, but it was not until the summer of 1953 that I was able to avail myself of the opportunity to be taken to the locality. The type-station is about 1 mile west of the highway bridge over the Hoh River, on the north side of the stream, along a small brook. Mr. Fletcher told me that Otis camped at this particular place, then generally known as "Mile 15," for several days while engaged on one of his engineering projects, and had said that he collected the grass in camp.

A *Glyceria* was found growing along this stream at the old campsite (Hitchcock 19891), although the plants were greatly shaded by the characteristic rank vegetation of the Hoh area. A more lush form of the grass was found on an exposed bank about 200 feet to the east of this spot (Hitchcock 19893), and it was also collected about 12 miles south of Queets (Hitchcock 19885). None of the plants of my collections has as prominent marginal nerves on the lemmas as do those of the type-collection of *G. Otisii*, and on this basis only, would be referable by means of Church's key (op. cit. 164) to *Glyceria* (or *Torreyochloa*) *pauciflora*, rather than to *G. (Torreyochloa) Otisii*.

However, in view of the great variation in the degree of prominence of the marginal nerves of the lemma in *G. pauciflora*, it is doubtful whether *G. Otisii* should be maintained, on

this character alone, at the specific level. Since it seems fairly certain that the plant (or plants) from which the species was described is not representative of a population now in existence, or in all probability in existence in 1927, I consider *G. Otisii* A. S. Hitchcock to be synonymous with *G. pauciflora* Presl.

A NEW COMBINATION IN FREMONTODENDRON. The taxon originally described as *Fremontia crassifolia* Eastw. occurs in the Santa Cruz Mountains of central California. The Subcommittee for Phanerogamae of the International Association for Plant Taxonomy by a vote of 6 to 5 recently rejected the conservation of *Fremontia* Torr. over *Fremontodendron* Cov. (Taxon 3:118,—1954). *Fremontia* had previously been listed among *nomina conservanda proposita* in the 1950 International Code of Botanical Nomenclature (Regnum Vegetabile 3:119,—1952). I am working on a flora of the Santa Cruz Mountains and am therefore making the following necessary new combination.

Fremontodendron californicum (Torr.) Cov. ssp. **crassifolium** (Eastw.) J. H. Thomas, comb. nov. *Fremontia crassifolia* Eastw., Leaflet West. Bot. 1:139,140 (1934). *Fremontia californica* Torr. ssp. *crassifolia* (Eastw.) Abrams, Ill. Fl. Pac. States 3:114 (1951).—JOHN H. THOMAS, Dudley Herbarium, Stanford University, Stanford, California.

THE TYPE OF ASTRAGALUS OOPHORUS VAR. LONCHOCALYX BARNEBY. Because a wrong line replacement was made in correcting proofs, citation of the type of this variety was only partly given when it was recently described (Leaflet West. Bot. 7: 194,—1954). Data pertaining to the type should read:

NEVADA: Fay, 3 miles east of Deer Lodge, Lincoln Co., alt. 6600 ft., April 24, 1939, *Percy Train 2630*; type in Herb. National Arboretum.

The rest of the paragraph is correct as it was published.—J. T. HOWELL.

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LEAFLETS *of* WESTERN BOTANY

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SAN FRANCISCO, CALIFORNIA

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JOHN THOMAS HOWELL

SUSAN G. STOKES, THE ERIOGONUM LADY

BY JOHN THOMAS HOWELL

The polygonaceous genus *Eriogonum*, so widespread and prevalent in the western United States, is one of those groups with special interest for students of plant distribution and floristics, particularly in the more arid or desert regions where its species are so numerous. Involved relationships between species and between variants within species attract students interested in evolutionary processes, while the response of the variants to differing environmental factors furnishes a fertile field for ecological investigation. Moreover, eriogonums usually have a definite esthetic attraction: whether the plant spreads flowery mats over coastal dune or montane scree, lifts filmy crowns in open forest or treeless steppe, waves slender wands above summer-dried slope or serpentine barren, or nestles tight and cushion-like on alpine summit or desert mesa, eriogonums have charm, esoteric at times it is true, but almost always they are attractive. It was to this outstanding group of western wild flowers that Susan G. Stokes, as a student of Prof. William Russel Dudley at Stanford University in the 1890's, gave her attention — then and for the rest of her life.

I first met Miss Stokes in August, 1929, when she came to the California Academy of Sciences to call on Miss Eastwood, her former teacher in the Denver High School, and to examine specimens of *Eriogonum* in the herbarium. Immediately we became good friends through our mutual interest in this group of plants, her interest going back more than three decades to her studies under Prof. Dudley, my interest dating back only a couple of years to field excursions in southern California deserts while I was at the Rancho Santa Ana Botanic Garden and at the University of California in Los Angeles. When I learned how long she

These papers that relate to Miss Stokes and to the plants she preferred are offered by their authors as a small tribute of affection and respect. I have been happy to use the sum she bequeathed me in defraying the cost of their publication.—J. T. HOWELL.

had studied in this genus — that she had even gone to Paris and Kew to perfect her knowledge and that she had in manuscript a complete revision — I quickly brought out my problems, for what student in the taxonomy of *Eriogonum* does not have his own particular problems in most any part of the genus? And so what might have been only a slight or passing acquaintance developed into a lasting friendship that not only encouraged my incipient interest in the genus but also promoted that interest through the years. Seven years later, with my editorial help and cooperation, she privately published her manuscript under the title, "The Genus *Eriogonum*, a Preliminary Study Based on Geographic Distribution."

Miss Stokes respected the opinions of botanical workers in her genus, but she was influenced, I believe, definitely and finally by the taxonomic ultra-conservatism of Katharine Brandegee, who for many years was her friend and adviser in San Diego. Miss Stokes shows this influence in the aggregation of few or many variants into broad complex species. She knew, however, her plants too well, both in the herbarium and in the field, to leave the variants in these complexes without names, and to name them she employed a form of nomenclature that at times seems awkward and unwieldy. Instances of relatively simple variation were treated in the usual manner, just as varieties or subspecies: but in more involved or complex species she used polynomials of four, and occasionally even of five, parts. She was convinced that such complexes were the result of climatic changes and consequent geographic migration of eriogonums in the later Tertiary, and her nomenclature was, at least in part, an attempt to convey that conviction into taxonomy. No field of natural science was ignored if it would furnish data pertaining to her thesis — so she explored not only various aspects of morphology but also genetics and physiology, as well as climatology, geography, and geology. Sometimes one feels that her taxonomy is based more on geophysical responses than on comparative morphology. In his review of Miss Stokes' revision, T. A. Sprague wrote: "Miss Stokes' little book is the result of many years study, and represents a courageous attempt to treat a large genus as an assemblage of living plants in their relationship with the environment, rather than as a series of bare morphological concepts" (Kew Bulletin 444, 1936).

Susan Gabriella Stokes was born in Lawrence, Kansas, February 27, 1868. While she was still a young girl, her family moved to Denver, Colorado, and there she attended the public schools, graduating from the Denver High School in 1884. Two years later in 1886 her family moved to San Diego, California, where she spent most of the rest of her life. She entered Stanford University one year after it opened and graduated in 1896. She later obtained her master's degree from the same institution and was honored with membership in Phi Beta Kappa. From 1914 to 1936, Miss Stokes was an instructor in science in the San Diego High School, where she was respected by faculty and students alike and was affectionately called "the eriogonum lady." In 1928 she was granted leave for a year, which was spent in study in Paris, London, Boston, New York, and Washington. She retired from her teaching position in 1936 and for more than a decade thereafter she made her home either at Stanford or Berkeley, pursuing the study of her favorite plants. Failing in health, she returned in 1950 to southern California and San Diego, where she died March 21, 1954.

The soothsayer in the second scene of "Anthony and Cleopatra" confesses that "in nature's infinite book of secrecy a little can I read." Those of us who knew Susan G. Stokes know that she, too, had read a little in that same book (and modestly she would have admitted the same), but we know too that the consuming ambition of her life was to read ever more and more.

THE WRITINGS OF SUSAN G. STOKES

A new species of *Chorizanthe* from Lower California. *Zoe* 5: 60 (1900).

A new species of *Eriogonum*. *Leafl. West. Bot.* 1: 23 (1932).

New western eriogonums. I. *Leafl. West. Bot.* 1: 29-30 (1932); II. 1: 34-36 (1933).

The genus *Eriogonum*, a preliminary study based on geographic distribution. Pages 1-124 (+ 8). J. H. Neblett Pressroom, San Francisco, California. June 1, 1936.

Further studies in *Eriogonum* [all published in *LEAFLETS OF WESTERN BOTANY*]. I. 2: 45-48 (1937); II. 2: 52-53 (1937); III. 2: 72 (1938); IV. 3: 15-18 (1941); V. 3: 200-202 (1943).

Chromosome numbers in the genus *Eriogonum* (with G. Ledyard Stebbins). *Leafl. West. Bot.* 7: 228-233 (1955).

CHROMOSOME NUMBERS IN THE GENUS ERIOGONUM

BY SUSAN G. STOKES AND G. LEDYARD STEBBINS

INTRODUCTION

During the years 1939 and 1940, Miss Stokes grew cultures of various species of *Eriogonum* in the greenhouse of the Department of Genetics, University of California, Berkeley, and with the aid of Mr. Ernest Jund made preparations of their root tips for a study of the somatic chromosomes. Since the number of species studied was relatively small, and she had hope of studying more, she did not attempt to publish the counts. Now, however, this publication seems worth while, since it points out some very interesting cytogenetic problems in the genus. The junior author has therefore undertaken to organize her notes, finish her drawings, and present the data in as complete a form as possible. Unfortunately, Miss Stokes did not leave any data on the particular specimens or collections from which she obtained the seeds of most of the species. Since, however, all of the seeds were obtained from wild sources, and since the determination of their identity was made by her, the species names can be considered correct.

MATERIAL AND METHODS

Root tips of the species listed were obtained from plants growing in pots, and were fixed in Randolph's craf solution. They were then dehydrated in a butyl alcohol series, embedded in paraffin, sectioned, and stained in gentian violet according to the technique employed in the work on *Cichorieae* (Babcock, Stebbins, and Jenkins, 1937). Drawings were made with a camera lucida, and are reproduced at a magnification of 1700x.

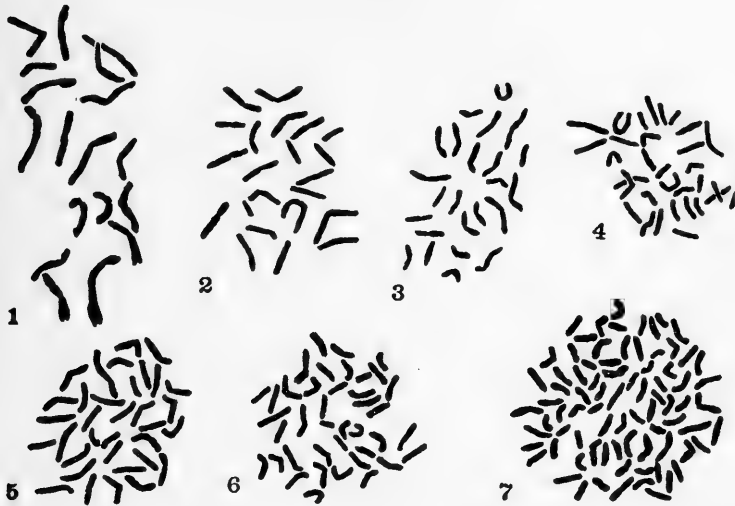
RESULTS

The somatic chromosome numbers are as follows:

Species	2n no.	Species	2n no.
<i>E. virgatum</i> Benth.	18	<i>E. crocatum</i> Davidson	40
" <i>E. adsurgens</i> Stokes"*	22	<i>E. fasciculatum</i> Benth.	40, 80
<i>E. gracile</i> Benth.	22	<i>E. latifolium</i> Sm.	40
<i>E. vimineum</i> Dougl.	24	<i>E. nudum</i> Dougl.	40, 80
<i>E. dasyanthemum</i> T. & G.	24	<i>E. indictum</i> Jepson	80
<i>E. elongatum</i> Benth.	34	<i>E. ovalifolium</i> Nutt.	40
<i>E. Wrightii</i> Torr.	34	<i>E. parvifolium</i> Sm.	40
<i>E. marifolium</i> T. & G.	32	<i>E. Parishii</i> Wats.	40

* This name has been published only as a synonym of *E. truncatum* var. *adsurgens* Jepson (Fl. Calif. 1:414). The plant concerned in the present chromosome count is undoubtedly the one Miss Stokes treated in her revision as *E. vimineum* subsp. *adsurgens* (Gen. Eriog. p. 52). I believe that this plant is a relative of *E. gracile* Benth. and different from the type of Jepson's variety. I have in manuscript an account of this nomenclatural confusion.—J. T. Howell.

With the exception of *E. Parishii*, of the subgenus *Ganysma*, and *E. marifolium*, of the subgenus *Eueriogonum*, all of the species listed belong to the subgenus *Oregonium*. They are all native to California.



Figures 1 to 7. Chromosomes of *Eriogonum*, drawn from somatic metaphase plates of root tips; magnification, $\times 1700$. Figure 1, *E. virgatum*, Fresno County, $2n=18$. Figure 2, *E. gracile*, San Diego County, $2n=22$. Figure 3, *E. vimineum*, $2n=24$. Figure 4, *E. marifolium*, Donner Summit, Placer County, $2n=32$. Figure 5, *E. elongatum*, Bradley, Monterey County, $2n=34$. Figure 6, *E. grande*, from Santa Cruz Island via Santa Barbara Botanical Garden, $2n=40$. Figure 7, *E. nudum*, Berkeley, $2n=80$.

The chromosomes of the different species differ from each other considerably in size. The largest chromosomes are found in *E. virgatum* (fig. 1), the smallest in those having $2n = 40$ or 80 as the somatic number (figs. 6-7); while the species with $2n = 22$, 24 , 32 , and 34 have chromosomes intermediate in size. In most of the preparations, the position of the centromeres was difficult to determine for many of the chromosomes, but the majority of the chromosomes have median or submedian centromeres. A pair of satellited chromosomes was seen in *E. virgatum* and some other species, but these in general were hard to detect. In some species, such as *E. marifolium*, the largest and smallest chromosomes differ greatly from each other in size.

Two species, *E. fasciculatum* and *E. nudum*, contain polyploid races within the species as ordinarily recognized by taxonomists.

The situation in *E. fasciculatum* has already been discussed by the junior author (Stebbins, 1942). The localities from which actual counts have been obtained follow. $2n = 40$: La Jolla, San Diego County, *T. W. Whitaker*; Descanso, San Diego County, *Churchill*; Kern River Park, Kern County, *A. A. Beetle*; Corral Hollow, west of Tracy, Alameda County, *G. L. Stebbins*. $2n = 80$: Ridge Route, south of Gorman, Los Angeles County, *G. L. Stebbins 2985*; Buellton, Santa Barbara County, *G. L. Stebbins*; Santa Ana Wash, Orange County, *Churchill*. Of the collections with $2n = 40$, those from San Diego County belong to subsp. *fasciculatum*, those from Kern and Alameda counties to subsp. *polifolium*. The three collections with $2n = 80$ belong to subsp. *foliolosum*. The distribution and relationships of these three subspecies are discussed and mapped by Stebbins (1942). In this complex, the pollen and stomata of the forms with 80 chromosomes are significantly larger than those of the 40-chromosome forms. The morphological and distributional evidence points to the probability that subsp. *foliolosum* has arisen from hybrids between subsp. *fasciculatum* and subsp. *polifolium*, through doubling the chromosome number.

In the complex of *E. nudum*, octoploids are much less frequent than in *E. fasciculatum*, judging from measurements of stomata and pollen. The somatic number $2n = 40$ was counted in the following collections: *E. latifolium*, Presidio, San Francisco, *S. G. Stokes*; *E. grande*, cultivated in Santa Barbara Botanical Garden, seed source, Santa Cruz Island; *E. nudum*, Antioch, Contra Costa County, *G. L. Stebbins 3050*; Corral Hollow, Alameda County, *G. L. Stebbins in 1940*; Garberville, Humboldt County, *G. L. Stebbins 3120*; Lake Tahoe, *S. G. Stokes*. The number $2n = 80$ was counted in the following: *E. indictum*, San Ardo, Monterey County, *G. L. Stebbins*; Atascadero, San Luis Obispo County, *G. L. Stebbins*; *E. nudum* var. *auriculatum*, Berkeley, *G. L. Stebbins*; Hecker Pass, Santa Cruz County, *S. G. Stokes*.

In the specimens of the 40-chromosome types, the length of the guard cells of the stomata ranges from 25 to 30 micra, while the pollen grains are 36–44 micra in length. On the other hand, the guard cells of the forms with $2n = 80$ are 30–40 micra long, while their pollen grains are 58–66 micra in length. Measurement of guard cells, pollen grains, or both in a series of 87 specimens of

the *E. nudum* complex in the University of California Herbarium gave the following results. Stomata and pollen grain similar to those of the collections known to have 40 chromosomes were found in 83 specimens, from the following counties: Del Norte, Humboldt, Trinity, Siskiyou, Modoc, Mendocino, Sonoma, Napa, Marin, Contra Costa, Alameda, San Francisco, San Mateo, Santa Cruz, Monterey, San Benito, Butte, Nevada, Mono, Inyo, Tuolumne, Merced, Fresno, Tulare, Kern, Ventura, Riverside. Types suspected of having 80 chromosomes are the following: Mt. Hamilton, Santa Clara County, *S. G. Stokes*; Jolon, Monterey County, *G. L. Stebbins*; Greenhorn Range, Kern County, *Hall & Babcock 5087*; New Idria, San Benito County, *Brewer*.

With the exception of the last two specimens, the known or suspected octoploids are confined to two regions, the upper Salinas Valley and the hills to the east and south of San Francisco Bay. The octoploid of the Berkeley Hills appears to be the only type found in that area, judging from external morphology and from approximate counts made on additional specimens from the east side of these hills, in Contra Costa County. It is distinguished from the tetraploids of the surrounding region, such as those from Corral Hollow, Antioch, and Tiburon, by its thick, heavy leaves with cordate bases, its thick, little-branched stems, its large, many-flowered involucre, and its large flowers. In many respects it is intermediate between typical *E. nudum* and *E. latifolium*.

DISCUSSION

Although the number of species studied is only a small fraction of the approximately 150 known species of *Eriogonum*, it is enough to give some idea of the chromosomal changes which have taken place during the evolution of the genus. The somatic number found most frequently, and the only one known in two different subgenera, is $2n = 40$. This is taken to be a tetraploid derivative from the original basic gametic number $x = 10$. Diploid species with $2n = 20$ have not yet been found, but there is every reason to believe that they exist. The strongest evidence for this is the existence within the complex of *E. vimineum* of species with $2n = 18$ (*E. virgatum*), $2n = 22$ (*E. gracile*, "*E. adsurgens*"), and $2n = 24$ (*E. vimineum*, *E. dasyanthemum*). It is hard to see how the numbers 18 and 22 could exist in the same group without the intermediate number 20.

The only basic number found in both of the other two large genera of *Polygonaceae*, *Polygonum* and *Rumex*, is $x = 10$ (Jaretzky, 1928). Combined with the evidence presented in this paper, this suggests that $x = 10$ is also the original basic haploid number in *Eriogonum*. Aneuploid lowering of the basic number to $x = 9$ and $x = 8$ appears to have taken place more than once in the evolution of the genus. The number $2n = 18$ in *E. virgatum* is best explained on this basis, while the number $2n = 34$ in the related species *E. Wrightii* and *E. elongatum* appears like the result of amphidiploidy from hybridization between species having the somatic numbers $2n = 18$ and $2n = 16$. The somatic number $2n = 32$, found in *E. marifolium*, appears like a tetraploid derivative from diploids with $2n = 16$. Aneuploid increase in the chromosome number has probably occurred in the *E. vimineum* complex.

If this interpretation of the evolution of chromosome numbers in *Eriogonum* is borne out by further cytological studies, then we must conclude that polyploidy has played a predominant role in the evolution of the modern species. Since most natural polyploids which have been carefully studied are known to be at least partly of hybrid origin (Stebbins, 1950), this means that the evolutionary "tree" of *Eriogonum* must be highly reticulate, with many of its species and species groups being of ancient hybrid origin. This condition would serve to explain to a large degree why the species of *Eriogonum* are difficult taxonomically, and further cytological studies as well as artificial hybridization should help to clear up some of the difficulties.

In this connection we must mention the fact that, unfortunately, *Eriogonum* is not particularly favorable cytogenetic material. Many of the species are relatively easy to grow in the greenhouse or garden, but others, particularly the perennials from desert regions, are very difficult. The chromosomes are not large, but they are not exceptionally small, and in paraffin sections of root tips are reasonably easy to count. On the other hand, meiosis is particularly difficult to study, because of the very small size of the buds and particularly the anthers at the stage of meiosis. Interspecific hybridizations have not yet been attempted, but they would probably be difficult, if emasculation were necessary. The very small flowers on delicate pedicels do not lend themselves to manipulation, and for each act of emasculation only

one seed could be expected. Whether any of the species are self incompatible is not known; if they are, then the genetic work in the genus would be much simplified.

On the other hand, to a cytogeneticist with the courage and patience to tackle such a genus, *Eriogonum* would prove very rewarding. Its species are one of the most characteristic features of the western American scene and contain many fascinating problems in ecology and plant distribution. As has been emphasized elsewhere (Stebbins, 1942, 1950), polyploid complexes can provide most valuable evidence concerning the history of floras, if the relationships between the ancestral diploids and the derived polyploids can be unravelled. The small amount of cytologic work already done on *Eriogonum* shows that this genus is no exception to the general rule, and further exploration of its cytogenetic intricacies should shed much new light on the history of the western North American flora.

SUMMARY

Somatic chromosome counts in 16 species of *Eriogonum* are reported. The original basic haploid number for the genus is believed to be $x = 10$, and the most common somatic number, $2n = 40$, is considered to be derived by polyploidy. The reduction of the basic number to $x = 9$ and $x = 8$ is postulated, with some species being polyploid or amphidiploid derivatives from these basic numbers. In other species groups, the basic number has apparently increased to $x = 11$ and $x = 12$. Polyploidy has been dominant in the evolution of the genus, and in its most recent phase has involved the development of polyploid complexes within the species groups of *E. fasciculatum* and *E. nudum*, both of which contain some forms with $2n = 40$ and other forms with $2n = 80$.

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THE GENUS ACANTHOGONUM, TRIBE
ERIOGONEAE

BY GEORGE J. GOODMAN

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When Torrey described the polygonaceous genus *Acanthogonum* in 1857, he included a single species, *A. rigidum*, also new. In 1858 he commented on better material that he had received from Fort Yuma, and also described "Acanthogonum? corrugatum (n. sp.)," remarking that this latter species seemed to be "almost intermediate between Acanthogonum and Chorizanthe." Twelve years later, in a revision of the *Eriogoneae*, Torrey and Gray considered *Acanthogonum* a section of *Chorizanthe*, transferring the two species and describing two new species in the section, *C. polygonoides* and *C. Watsoni*. Practically no authors except Rydberg, in *Flora of the Rocky Mountains and Adjacent Plains*, and the present writer, in 1934, have since recognized *Acanthogonum*.

Chorizanthe corrugata, *C. Watsoni*, and the related *C. Orcuttiana* Parry were considered by Goodman, in a revision of *Chorizanthe*, 1934, to be closely related species in the subsection *Chorizanthella*. They are unusual in the genus in having the stamens attached high on the perianth-tube and in having short styles. They nevertheless seem best treated as *Chorizanthe*, particularly in view of the straight, linear cotyledons.

The other two species, *Acanthogonum rigidum* and *A. polygonoides*, however, differ sufficiently from *Chorizanthe*—even from the aberrant species mentioned above—to appear still to constitute a separate genus. The most important differentiating character, in the opinion of the writer, lies in the nature of the embryo. In this segregated genus, the cotyledons are circular and accumbent, in contrast to the linear and straight cotyledons which characterize *Chorizanthe*. The insertion of the stamens at the base of the short perianth-lobes and the frequent occurrence in *A. rigidum* of more than one flower in an involucre further differentiate the genus. The significance of the characters upon which *Acanthogonum* is maintained can be judged more readily when an overall view of the tribe *Eriogoneae* is presented and hence a fuller discussion is not wholly justified here.

Acanthogonum Torr., in Pac. R. R. Rept. 4: 132-133 (1857).

Annual, pubescent, non-glandular desert plants; stems dichotomously branched; bracts opposite; involucre sessile, the tube triangular in cross-section and with transverse corrugations; flowers 1-4, short-pedicellate, hairy on the outside, perianth lobed or cleft, the (usually) 6 segments similar; stamens 9 or fewer, attached at the base of the perianth-lobes, included, filaments short, anthers orbicular or nearly so; achene trigonous above, oval to circular below, styles 3, short and straight, stigmas capitate; embryo with accumbent, circular cotyledons.

Type species: *Acanthogonum rigidum* Torr.

KEY TO THE SPECIES

Involucres with straight spines and more than 3 longitudinal ribs; alternate stem leaves present. 1. *A. rigidum*

Involucres with uncinatate spines and with but 3 longitudinal ribs (these at the angles); alternate stem leaves absent. 2. *A. polygonoides*

1. ACANTHOOGONUM RIGIDUM Torr., Pac. R. R. Rept. 4: 133 (1857); Torr., Pac. R. R. Rept. 5: 363 (1858); Torr. Bot. Mex. Bound. Surv. 177 (1859); Rydb., Fl. Rocky Mts. 229 (1918) and ed. 2 (1923); Goodman, Ann. Mo. Bot. Gard. 21: 91 (1934).

Chorizanthe rigida (Torr.) T. & G., Proc. Amer. Acad. 8: 198 (1870), and most subsequent authors.

Upright or spreading plants with short-villous stems; leaves alternate, petiolate (the petioles often longer than the blades), blades ovate to elliptic or oblanceolate, tomentose beneath, sparsely villous above; bracts opposite, spinescent, often long; the involucre sessile in the axils of the bracts and leaves, often forming glomerules covering the stem to its base; involucre tube 2-2.5 mm. long, pubescent, several ribbed, teeth 3, tipped with straight spines, one tooth usually longer than the others, often greatly so and exceeding 1 cm.; flowers 1-4, yellow, barely exerted, up to 1.5 mm. long, tube cylindrical and covered with appressed hairs, lobes lanceolate, a third as long as the tube; achene 2.25 mm. long.

When more than one flower is present in an involucre, all or all but one are staminate. These staminate flowers are smaller than the perfect and on longer pedicels.

Type: "On Williams' river, a fork of the Colorado, western New Mexico," (Arizona), Dr. J. M. Bigelow, 1854.

Number of collections seen: 123. Of these 49 came from three California counties, Inyo, San Bernardino, and Riverside.

Time of flowering: primarily March, April, and May.

Distribution. UNITED STATES. CALIFORNIA: Imperial, Inyo, Kern, Riverside, San Bernardino, and San Diego counties. NEVADA: Clark, Esmeralda, Lincoln, Mineral, Nye, probably Washoe, and Pershing or Churchill counties. ARIZONA: Maricopa, Mojave, Pima, Pinal, and Yuma counties. UTAH: Washington County.

MEXICO: Baja California, Sonora.

2. ACANTHOOGONUM POLYGONOIDES (T. & G.) Goodman, Ann. Mo. Bot. Gard. 21: 91 (1934).

Chorizanthe polygonoides T. & G., Proc. Amer. Acad. 8: 197 (1870), and most subsequent authors.

Prostrate plants with spreading pubescent stems; leaves basal, petiolate, narrow-oblongate to broad-elliptic, scantily pilose; bracts opposite, the lower stalked and resembling the leaves, broad-elliptic, spreading pilose, becoming narrower higher on the plant; involucre in alternating clusters on the main stems or solitary in the lower forks, about 5 mm. long, the tube 2-2.5 mm. long, the 3 main teeth uncinatate, and usually with 2 or 3 small uncinatate spines arising from between the main teeth; flowers solitary, barely exerted, up to 2.5 mm. long, lobes 6 or 5, a third as long as the tube, often minutely emarginate; stamens usually 6.

The species consists of two varieties, coinciding well (perhaps completely) with their distinct geographic areas.

2a. *A. POLYGONOIDES* var. *POLYGONOIDES*.

Chorizanthe polygonoides T. & G., loc. cit.

Type: " 'Reservoir Hill,' Placerville (El Dorado Co.), California," *Volney Rattan*.

Number of collections seen from the northern part of the range of the species: 31. Most of these have been examined as to variety and found to be the typical variety.

Time of flowering: primarily May and June.

Distribution. CALIFORNIA: Butte, Calaveras, Eldorado, Lake, Marin, Modoc, Napa, Nevada, Plumas, and Sacramento counties.

2b. *A. polygonoides* var. *longispinum* Goodman, var. nov. A varietate typica differt: plantae gracilliores, involucri minoribus glabrationibusque et dentibus ac spinis longioribus.

This southern variety is more slender, the involucre are smaller, more glabrate, and with nearly straight sides. The involucre teeth are longer, when compared to the tube or to the actual length of the teeth in the northern variety, and the spine portion is longer.

Type: San Diego, California, April 25, 1903, *Brandegee 3412* (UC). Isotypes at CAS, DS, MO, NY, POM.

Number of collections seen from the southern part of the range of the species: 24. Of these, 12 have been examined with a view to ascertaining their variety. Some were from San Diego County, California, and some from Baja California. Two specimens from western Riverside County, California, have not been reexamined, so the record, as to variety, from there is not final.

Time of flowering: primarily April and May.

Distribution. UNITED STATES. CALIFORNIA: Riverside and San Diego counties.

MEXICO: Baja California.

Specimens cited. CALIFORNIA. San Diego Co.: Cuyamaca Lake, alt. 4700 ft., June 25, 1903, *Abrams 3890* (DS, MO, NY, US); Point Loma, April 25, 1897, K. Brandegee (UC); San Diego, April, 1903, K. Brandegee (DS, UC, US); Point Loma, April 28, 1905, K. Brandegee (UC); San Diego, Brandegee 3412 (type); San Diego, May 4, 1884, D. Cleveland (MO, UC); San Diego, April, 1903, H. M. Hall (UC); Point Loma, April 21, 1884, C. R. Orcutt (MO, NY, UC, US); Mesa, May 8, 1884, C. R. Orcutt (MO).

MEXICO. BAJA CALIFORNIA: dry stony slope, 45 miles southeast of Tecate, May 14, 1925, P. A. Munz 9603 (POM, UC, US); San Antonio, April 6, 1886, C. R. Orcutt (NY); (essentially the same data as the Munz collection from Tecate) F. W. Peirson 5857 (RSA, UC).

ERIOGONUM NOTES IV: A NEW SPECIES
FROM CALIFORNIA

BY JOHN THOMAS HOWELL

Eriogonum apricum J. T. Howell, spec. nov. Herba perennis radice lignea elongata caudice compacto pauciramoso, ramis caudicis brevibus rosulas foliorum ferentibus, infra basibus tomentosis foliorum veterium vestitis, caules erectos patentessve graciles annuos 2- vel 3-chotomos 8-20 cm. longos nodis tribracteatis internodis glabris emittentibus supra; foliis basalibus plerumque parvis brevipetiolatis, rotundo-ovatis, 3-5 (vel 10) mm. et longis et latis, mature glabratis supra, dense et perseveranter tomentosis subter, basi cordatis vel rotundatis, obtusis vel acutiusculis apice, petioliis 3-10 (vel etiam 25) mm. longis, bracteis caulium annuorum externe glabris tomentosis interne; involucris solitariis sessilibus plerumque terminalibus, raro spicatis, cylindraceutis vel campanulatis, 2-2.5 mm. longis, 5-lobulato-costatis circa ad medium, truncate scarioso-membranaceis inter costas, glabris externe, sparse tomentellis secundum costas interne, membrana tomentello-ciliata, bracteolis plumosis, aliquando paulum exsertis; perianthiis 2 mm. longis, segmentis oblongis obtusis similibus, albis cum costa rubida vel rubescentibus, externe glabris, sparse longo-pilosis infra medium interne, perianthiis in fructu paulum accrescentibus circa 3 mm. longis basi subinduratis costis paulum crassiusculis; staminibus breviter exsertis, filamentis basi minute pilosis; ovario glabris; acheniis 2.5 mm. longis, rostro crasso cellularibus, basi subglobosa nitentibus laevibusque.

Type: Herb. Calif. Acad. Sci. No. 391439, collected from an exposed declivity of red and white clay in the foothills of the Sierra Nevada near Ione, about 2 miles north-northeast of Buena Vista, altitude about 300 feet, Amador County, California, Sept. 5, 1954, J. T. Howell 30033. Other collections made in 1954 at the same station by the author are: No. 29793 on May 18 (in bud) and No. 30000 on June 8 (in early anthesis). A fungus on the dead annual stems has been identified by Dr. Lee Bonar as *Coniophyrium Eriogoni* Earle.

This distinguished accession to *Eriogonum* in California, which was discovered while I was searching the Ione hills for *Arctostaphylos Helli* Eastw., is nearly restricted to a steep outcrop of red and white clay where nothing else grows. On a brown-colored bed that underlaid the red and white beds at the base of the slope, a few individuals of the *Eriogonum* persisted, but other plants, chiefly *Juncus confusus* Cov. and *Arctostaphylos myrtifolia* Parry, were more common. *Eriogonum apricum* was not found on other outcrops of the red and white clay that I explored, but it is to be expected elsewhere in a similar habitat in the hills near Ione. These peculiar clays belong to the Ione

formation, a geologic series of Eocene age of interrupted occurrence in the Sierran foothills (The Ione Formation of California by Victor T. Allen, Univ. Calif. Publ. Geol. Sci. 18:347-448, 1929). On this formation around Ione, *E. apricum* will take its place with such other restricted Sierran endemics as *Potentilla Parryi* (Greene) Greene, *Helianthemum suffrutescens* Schreiber, and *Arctostaphylos myrtifolia* Parry.

In spite of the perennial character of the plant, *E. apricum* appears to be most closely related to those annuals of which *E. vimineum* Dougl. is the type. Because *E. apricum* is perennial, it might be inferred that it has been derived from some perennial stock found in the Great Basin (such as that which perhaps gave rise to *E. Batemani* Jones), but the strong resemblance of the Ione plant, not only in general appearance but also in characters of inflorescence and flowers, to such relatives of *E. vimineum* as *E. Nortoni* Greene and *E. viminium* var. *caninum* Greene is to me an indication of real affinity.

MALVASTRUM, A. GRAY — A RE-DEFINITION OF THE GENUS

BY THOMAS H. KEARNEY

This genus was published by Gray, in 1849 (*Plantae Fendleri-anae*, Mem. Amer. Acad. Sci. ser. 2, 4:21,22). From the first, it has been a perplexing aggregate. The author enumerated 8 species, of which the first 3 have since been transferred to *Sphaeralcea*, St. Hil., the fourth to *Malacothamnus*, Greene, and the last to *Sidopsis*, Rydb. The remaining 3 species, listed by Gray under sect. *Chrysanthae* (*Malva* sect. *Chrysanthae* DC., Prodr. 1:430) are *M. Wrightii* A. Gray, now referred to *M. aurantiacum* (Scheele) Walp., *M. carpinifolium* A. Gray, and *M. spicatum* (L.) A. Gray, now referred to *M. americanum* (L.) Torr.

Practically the only characters which these 8 species have in common are the triphyllous involucl (often absent in *M. coccineum*), the capitate stigmas, and the solitary, ascending ovule. It is no wonder, therefore, that Gray's brief description of the genus fails to define it. The confusion is shown by the fact that Bentham & Hooker (*Gen. Pl.* 1:197) placed *Malvastrum* in tribe *Malveae* subtribe *Eumalveae* (subtribe *Malvinae* of Schumann

in Die Natürlich. Pflanzenfam. 6³:36, 41), although the other genera which these authors referred to this subtribe have slender, introrsely stigmatic styles rather than capitate stigmas.

It would appear, from Gray's comments (*ibid.*), that he regarded his first 4 species as more typical than the 3 species he listed under section *Chrysanthae*. He wrote "If the yellow-flowered species, with a somewhat different habit and usually a manifest persistent involucre, which form the second section (the *Chrysanthae* DC. etc.) are correctly referred to this genus, it will comprise a large number of species from tropical and South America, which need an elaborate revision."

Since the name *Malvastrum* has been conserved (Intl. Rules Bot. Nomenclature, ed. 3, 102,—1935) and since the first 3 species of Gray's list have been transferred subsequently to *Sphaeralcea*—*M. Munroanum* by Gray himself—and the fourth to *Malacothamnus*, as *M. Fremontii* (Torr. ex Gray) Greene, it is obvious that a re-definition of the genus is required. As I would define it, the genus comprises only perennial, often somewhat woody species of tropical and subtropical America having a persistent, triphyllous involucre, yellow corollas, and nearly indehiscent, dorsally smooth, laterally smooth or rugose carpels. The chromosome number has been determined by Skovsted (Journ. Genetics 31:263) as (*n*) 12 in *M. americanum* (*M. spicatum*), *M. coromandelianum*, and *M. scoparium*, and by Krapovickas as (*2n*) 12 in *M. spiciflorum*, 24 in *M. amblyphyllum*, and 36 in *M. interruptum*. A tentative list of the species of this relationship has been given me by Ingr. A. Krapovickas. They are:

M. AMBLYPHYLLUM R. E. Fries

M. AMERICANUM (L.) Torr. *M. spicatum* (L.) A. Gray

M. AURANTIACUM (Scheele) Walp. *M. Wrightii* A. Gray

M. BICUSPIDATUM (S. Wats.) Rose

M. CORCHORIFOLIUM (Desr.) Britton ex Small. *M. Rugelii* S. Wats.

M. COROMANDELIANUM (L.) Garcke. *M. tricuspidatum* (Ait.) A. Gray

M. GUATEMALENSE Standl. & Steyerl.

M. INTERRUPTUM K. Schum.

M. LACTEUM (Ait.) Garcke. *M. vitifolium* (Cav.) Hemsl.

M. SCOPARIUM (L'Hér.) A. Gray. *M. scabrum* (Cav.) A. Gray, and, perhaps *M. depressum* (Benth.) Svenson, *M. dimorphum* J. T. Howell, and *M. scoparioides* Ulbr.

M. SPICIFLORUM (Hassler) Krapov.

M. SUBTRIFLORUM (Lag.) Hemsl. *M. ribifolium* (Schlecht.) Hemsl., *M. mexicanum* (Schauer) Hemsl., *M. Schaffneri* S. Wats., *M. Greenmanianum* Rose.

I proposed, in 1947 (Leafl. West. Bot. 5:23,24) *Malvastrum coromandelianum* (L.) Garcke as a lectotype for the genus, as thus restricted, citing *M. carpinifolium* A. Gray as a synonym. Unfortunately, Gray in publishing *M. carpinifolium* (Pl. Fendl. p. 22) gave several synonyms, of which the first two are *Sida carpinifolia* L. f. and *S. planicaulis* Cav. These are true *Sida*, lacking an involucre and having a pendulous ovule. They are related to, if not identical with, *S. acuta* Burm. But Gray cited also *Malva tricuspidata* Ait., which is undoubtedly *Malvastrum coromandelianum*, and it is clear from Gray's description of his *M. carpinifolium* that this was the plant he had in mind. Three years later, in *Plantae Wrightianae* (1:16), Gray recognized his mistake and published the combination *Malvastrum tricuspidatum* (Ait.) A. Gray, giving as a synonym "*M. carpinifolium* A. Gray (excl. syn. *Sida carpinifolia* and *S. planicaulis*)." In view of these facts, it would seem permissible to retain *M. coromandelianum* [*M. tricuspidatum* (Ait.) A. Gray] as the lectotype of the genus *Malvastrum* as I would re-define it. This is by far the most abundant and widely distributed species, now well established in the eastern hemisphere, although doubtless of American origin.

Many species, formerly included in *Malvastrum*, have been transferred to other genera — *Eremalche*, *Malacothamnus*, *Monteiroa*, *Sidopsis*, *Sphaeralcea*, *Tarasa*, and *Urocarpidium*. Many others, which do not conform to the definition proposed above of the restricted genus *Malvastrum*, remain to be disposed of. In an earlier paper (*Amer. Midl. Nat.* 46:119–121), I discussed 4 groups, regarded as atypical: *Peruvianae*, *Eremalche*, *Acaules*, and the South African species that have been included in *Malvastrum*.

The group of which *M. peruvianum* (L.) A. Gray is typical comprises herbaceous species, mainly South American, having usually circinate inflorescences and mauve or purple corollas. The chromosome number (n) as determined by Skovsted (*ibid.*) in *M. peruvianum* and *M. limense* (L.) J. Ball is 15, as compared with 6 to 18 in what I regard as true *Malvastrum*. This group of species has been transferred recently by Krapovickas to the hitherto monotypic genus *Urocarpidium* Ulbr.

Eremalche, Greene, now appears to me to be a valid genus, comprising 4 species of annual plants of the southwestern United States, with solitary or geminate axillary flowers, purple or whit-

ish corollas, and round, muticous carpels that open irregularly at maturity by disintegration of the lateral walls.

The numerous acaulescent species of high elevations in the Andes, including those which A. W. Hill monographed in 1909 (Jour. Linnaean Soc. London, Bot. 39:216—230) are certainly to be excluded from *Malvastrum*, as I would define that genus. Hill stated (ibid., p. 216) that this is "possibly not a very natural group since they [the species] probably represent the high alpine forms of this large genus [*Malvastrum*] and may perhaps be more closely related to some caulescent forms — living or extinct — than they are to each other." It would seem that one or more new genera will have to be erected to provide for these plants, but much further study is needed before they can be disposed of satisfactorily. The comparative rarity of specimens with mature fruit enhances the difficulty.

Malvastrum humile (Gill.) A. Gray has been transferred by Krapovickas to the genus *Tarasa* (Bol. Soc. Argent. Bot. 5:117) and *M. decipiens* (St. Hil. & Naud.) K. Schum. (*M. nudum* K. Schum.?) is a *Sphaeralcea* according to the same authority (Lilloa 17:216).

The two dozen or so South African species hitherto referred to *Malvastrum* offer an additional problem. They are mostly shrubby or suffrutescent plants with red or purple corollas and indehiscent or only slightly dehiscent carpels. Skovsted (ibid.) determined the number of chromosomes (n) in *M. capense* (L.) Garcke as 22 and in *M. grossulariaefolium* (Cav.) Garcke as 21. Here again a new genus seems to be indicated but, so far as I know, none has been proposed.

Finally, it appears that some other disposition must be found for a few aberrant species that have been described as *Malvastrum*, such as *M. palustre* Ekman and *M. Sandemanii* Sandwith.

A TENTATIVE KEY TO THE NORTH AMERICAN SPECIES OF ABUTILON, MILLER

BY THOMAS H. KEARNEY

This is an artificial key to *Abutilon* and juxtaposition of species does not necessarily indicate close relationship. Whenever possible, the characterizations have been based upon her-

barium specimens and (or) photographs of types, but in several cases published descriptions have been the only available source of information. The segregate genera *Bakeridesia* Hochr. and *Bogenhardia* Reichenb. (*Gayoides* Small) are not included. North America is interpreted as including the West Indies and the Republic of Panama.

A South American species, *Abutilon megapotamicum* (Spreng.) St. Hil. & Naud. is often cultivated as an ornamental in North America and may occasionally escape. It is easily recognized by its inflated, commonly red or brown, tubular calyx.

The genus is a very difficult one and much further investigation will be required to solve all of the problems. Note 1.

1. Carpels normally 5 (but sometimes 6 in *A. ellipticum* and *A. incanum*), pauciovulate except possibly in *A. Marshii* (2). Note 2
1. Carpels (except sometimes in *A. Picardae* and perhaps occasionally in *A. umbellatum* and *A. Wrightii*) more than 5 (14).
2. Petals 20 mm. long and about $\frac{1}{2}$ as wide. Herbage whitish-velutinous with stellate hairs; leaves broadly ovate, deeply cordate, acuminate, coarsely dentate; flowers in a small, terminal subcorymbose cluster; calyx about 9 mm. long, the lobes ovate-lanceolate, cuspidate; fruit unknown. Texas (Chisos Mountains).....*A. Marshii* Standl.
2. Petals not more than 12 mm. long (3).
3. Stems hirsute with very long and fine, spreading, nonglandular, simple hairs or sometimes (in *A. Thurberi*), nearly glabrous. Plants herbaceous above the caudex; calyx-lobes deltoid; petals yellow; carpels aristate (4).
3. Stems with few or no such hairs or if softly pilose with rather long, mainly simple, spreading hairs (in *A. percaudatum*) then these somewhat glandular (5).
4. Leaves sharply long-acuminate, rather finely dentate; calyx less than $\frac{1}{2}$ as long as the fruit, stellate-pilose; petals about 5 mm. long; carpel-awns 1.5 mm. long, rather stout. Guatemala.....
.....*A. orientale* Standl. & Steyerl. Note 3
4. Leaves abruptly short-acuminate; calyx more than $\frac{1}{2}$ as long as the fruit, long-hirsute; petals up to 8 (?) mm. long; carpel-awns 2-3 mm. long, slender, spreading or recurved, stellate-hirsute. Flowering stems from creeping rootstocks. Southern Arizona and northern Mexico.....
.....*A. Thurberi* Gray
5. Stems obtusely trigonous and deeply sulcate above. Herbage finely stellate-tomentose, also more or less glandular-puberulent and (rarely) with a few, long, simple hairs; leaves long-petiolate, cordate, rather abruptly long-acuminate, crenate or subentire; flowers in a very open, leafy panicle; calyx less than $\frac{1}{2}$ as long as the carpels, spreading or reflexed in fruit; corolla yellow, often with a dark center, the petals

- about 5 mm. long; fruit truncate, the carpels often slightly constricted above the base, mucronate to cuspidate. West Indies, southern Texas, Mexico, and Central America. . . . *A. trisulcatum* (Jacq.) Urban. Note 4
5. Stems terete or, if more or less angulate-sulcate, then the other characters not combined as above (6).
6. Calyx much longer than the carpels and nearly as long as the corolla. Leaves long-petiolate, broadly ovate, shallowly cordate, shortly acuminate, finely dentate; flowers laxly paniculate, the peduncle hirsute and somewhat glandular; carpels about 6 mm. long, muticous, finely tomentose. Mexico. *A. bastardioides* Baker f.
6. Calyx shorter or only slightly longer than the carpels (7).
7. Petals, so far as is known, yellow, orange, or (in *A. parvulum*) sometimes crimson, basal spot. An undershrub or nearly herbaceous; leaves mostly considerably longer than wide, finely to coarsely dentate, usually gradually long-acuminate; flowers axillary but somewhat congested at ends of the branches, small, the petals 5-6 mm. long; fruit truncate, the carpels 7-8 mm. long, muticous or mucronate. Southern Arizona and northwestern Mexico, including Baja California. *A. Pringlei* Hochr. Note 5
7. Petals, so far as is known, yellow, orange, or (in *A. parvulum*) sometimes red, usually without a conspicuous basal spot (8).
8. Carpels long-cuspidate or aristate (9).
8. Carpels short-beaked to muticous (11).
9. Stems woody; petioles 2 cm. long or shorter; peduncles spreading; fruit much surpassing the calyx; carpels with long, spreading awns, stellate-hirsute, the awns 3-5 mm. long. Leaves green and appressed-pubescent above with simple hairs, somewhat paler and stellate-pubescent beneath, thin, ovate to elliptic-lanceolate, serrate or crenate, sometimes shallowly trilobate; flowers few, in open, terminal panicles; corolla orange-yellow. Southern Mexico. *A. ellipticum* Schlecht. Note 6
9. Stems (except possibly in *A. coahuilae*) herbaceous throughout; petioles mostly much more than 1 cm. long; peduncles erect or ascending; carpels with shorter, suberect awns. Leaves concolorous or nearly so (10).
10. Leaves thin, green, glabrescent, truncate or obscurely cordate at base, coarsely crenate-dentate, the petioles slender; flowers few, mostly in small loose clusters on axillary branchlets; petals about 10 mm. long; carpels stellate-hirsute. Mexico (Tepic and perhaps in Jalisco). *A. membranaceum* Baker f.
10. Leaves thickish, whitish and minutely stellate-tomentose on both surfaces, subcordate at base, sharply serrate, the petioles stout; flowers numerous in an elongate, leafy, narrow panicle; carpels stellate-tomentose. Mexico (Coahuila). *A. coahuilae* Kearney
11. Stems copiously soft-pilose with rather long, somewhat glandular hairs; petals 10-12 mm. long. Plants herbaceous or nearly so; leaves thin, nearly concolorous, up to 10 cm. long, about $\frac{1}{2}$ as to nearly as wide

- as long, rather deeply cordate, caudate-acuminate at apex; carpels about 10 mm. long, finely pubescent. Mexico (San Luis Potosi).....
*A. percaudatum* Hochr.
11. Stems not glandular-pubescent; petals mostly less than 10 mm. long. Leaves dentate; fruit truncate (12).
12. Calyx erect in fruit, 2/3 to nearly as long as the carpels. Herbage finely tomentose; inflorescence, when well developed, an elongate, leafy, many-flowered panicle; carpels 6-9 mm. long, rounded or obtuse at apex, rather coarsely stellate-pubescent. Texas, southern New Mexico, and northern Mexico.....*A. malacum* Wats.
12. Calyx spreading or reflexed in fruit, much shorter than the carpels. Petals usually without basal spots (13).
13. Petals 6-9 mm. long, yellow or orange; carpels (sometimes 6 in number) 6-8 mm. long, mucicous or apiculate (exceptionally cuspidate), finely stellulate; plants usually sulfrutescent; stems erect, sometimes triquetrous above; leaves often more than 3 (up to 7) cm. long, denticulate to coarsely dentate; flowers numerous, often somewhat congested at the ends of the branches. Oklahoma and Texas to Arizona and northern Mexico (including Baja California).....*A. incanum* (Link) Sweet. Note 7
13. Petals 4-6 mm. long, orange-pink or red; carpels 8-9 mm. long, mucronate or cuspidate; plants herbaceous above the crown; stems spreading or decumbent, often vine-like; leaves not more (usually less) than 3 cm. long, usually coarsely dentate; flowers few, solitary in the axils. Southwestern United States and northern Mexico.....*A. parvulum* Gray
14. Flowers large, the petals 25 mm. or longer (15).
14. Flowers smaller, the petals (except occasionally in *A. hypoleucum*, *A. Palmeri*, and perhaps *A. amplexifolium*) less than 25 mm. long (27).
15. Petals deeply bilobate, 28-30 mm. long, yellowish with a purple base; carpels pauciovulate. Leaves suborbicular, rounded at base, entire-margined; flowers solitary; peduncles 2-4 cm. long; mature fruit unknown. Guatemala.....*A. Pittieri* Donn.-Smith
15. Petals not deeply lobed; carpels (except possibly in *A. Chittendenii* and *A. vulcanicola*) pluriovulate (16).
16. Leaves deeply 3-5-lobed. Herbage glabrate or puberulent; flowers axillary, long-pedunculate, often nodding; petals 25-40 mm. long, deep yellow with red veins; androecium usually exerted; carpels about 11, the ovules numerous; mature fruit apparently not known. South America; escaped from cultivation or sparingly naturalized in Jamaica, Mexico, and Guatemala.....*A. striatum* Dicks. Note 8
16. Leaves deeply 3-5-lobed. Herbage glabrate or puberulent; flowers axillary, slightly 3-lobed (17).
17. Androecium nearly twice as long as the petals, these 40-50 mm. long, orange or salmon-colored with conspicuous red veins. Leaves large, obscurely crenulate, conspicuously discolorous; peduncles often 3-flowered; carpels long-rostrate, nearly 30 mm. long. Guatemala.....
*A. tridens* Standl. & Steyerl.

17. Androecium (except perhaps in *A. Pachecoanum*) not or little longer than the petals (18).
18. Petals 45–60 mm. long. Shrubs or small trees up to 6 m. high; leaves broadly ovate or suborbicular, sometimes obscurely 3-lobed, the margins entire or merely undulate; flowers long-pedunculate (19).
18. Petals usually less than 45 mm. long (21).
19. Stems copiously villous above with rather long, spreading, simple hairs in addition to other pubescence; flowers mostly in 3's, long-pedunculate; petals deep wine-red, not becoming reflexed; column staminiferous for some distance below the apex; carpels about 10, stoutly aristate, about 40 mm. long, stellate-pilose; leaves very large. Southern Mexico, Guatemala.....*A. Pachecoanum* Standl. & Steyerl.
19. Stems without long, simple hairs, roughly scurfy-pubescent with brownish, stellate hairs; flowers solitary or binate; petals yellow or orange, becoming reflexed; column staminiferous only at apex; carpels very numerous, about 24. Leaves more or less coriaceous, conspicuously veiny beneath (20).
20. Calyx densely and roughly lanate, the lobes shortly acuminate; mature fruit unknown. Stipules ovate or broadly lanceolate. Guatemala....
.....*A. Nelsoni* Rose
20. Calyx finely tomentose, the lobes long-acuminate; carpels coarsely and roughly stellate-pubescent, thin-walled, muticous, rounded at apex, apparently triovulate. Androecium 25 mm. long. El Salvador.....
.....*A. vulcanicola* Standl.
21. Leaf-margins entire or merely slightly undulate. Carpels (in *A. yucatanum*?) muticous (22).
21. Leaf-margins crenulate to coarsely crenate. Petals mostly 30–35 mm. long, yellow (in *A. Purpusii*?); androecium shorter than the petals; carpels muticous; leaves very large, up to 20 cm. long, ovate to suborbicular, cordate (25).
22. Calyx not more than 10 mm. long, whitish-tomentose, cleft to about the middle. Petals 25–35 mm. long, yellow; carpels 12–15 mm. long, rounded at apex. Mexico (Oaxaca and Chiapas). .*A. Bakerianum* Rose
22. Calyx more than 10 mm. long, brownish, scurfy-tomentose (23).
23. Peduncles erect or spreading, 7 cm. or shorter, the flowers not nodding. Petals relatively broad, (30?) 35–40 mm. long, yellow or cream-colored, with a dark red or maroon basal spot; leaves sometimes obscurely 3-lobed; a small tree. Guatemala, Honduras, and perhaps El Salvador
.....*A. Chittendenii* Standl.
23. Peduncles more or less recurved, often 8 cm. or longer, the flowers more or less nodding (24).
24. Calyx 13–17 mm. long, the lobes attenuate-acuminate; petals 25–30 mm. long, relatively broad (at least $\frac{1}{2}$ as wide as long) with a rather inconspicuous, purple basal spot; leaves deeply cordate. Mexico (Vera Cruz)
.....*A. Peyritschii* Standl. Note 9
24. Calyx 20–25 mm. long; petals 40–45 mm. long, relatively narrow; leaves moderately cordate. Yucatan.....*A. yucatanum* Standl.

25. Flowers more or less nodding; carpels 25–30 mm. long. Leaves rather finely crenate-dentate; petals long-clawed. Southern Mexico, Guatemala. *A. Purpusii* Standl.
25. Flowers not nodding; carpels about 20 mm. long (26).
26. Leaves undulate-crenulate; flowers solitary in the axils; carpels 12. Petals rather long-clawed. Mexico (Jalisco). *A. jaliscanum* Standl.
26. Leaves rather coarsely crenate; flowers often subracemose at ends of the branchlets; carpels 7–10. Costa Rica, Panama. *A. Brenesii* Standl.
27. Corolla rose-pink or purple, at least when fresh, exceptionally white, perhaps rarely yellow (28).
27. Corolla (so far as is known) yellow, orange, or (exceptionally) whitish, with or without a darker center (34). Note 10
28. Petals about 9 mm. long, bluish-purple, becoming reflexed; carpels 18–24, pauciovulate. A small tree; herbage, peduncles, and calyx scurfy-stellulate; leaves very large, often slightly 3-lobed, obscurely denticulate; flowers in dense, subcorymbose clusters at ends of (often elongate) axillary branchlets; calyx cleft nearly to the base, the lobes oval, obtuse or acutish; mature fruit unknown. Guatemala.
. *A. pleiopodum* Donn-Smith. Note 11
28. Petals longer, not becoming reflexed; carpels fewer (29).
29. Corolla rose-pink to (exceptionally) white (rarely yellow?); carpels pluri-ovulate. Plants shrubby or arborescent, up to 4 m. high; stems stellate-tomentose and usually also with long, spreading, simple hairs; leaves velutinous, more or less discolorous, broadly ovate, cordate; flowers axillary, mostly solitary; petals up to 25 mm. long but usually shorter; carpels 10–14, cuspidate or shortly aristate, villous, 13–16 mm. long. Southern Florida, southern Texas, and West Indies, perhaps also in Mexico and Honduras.
. *A. Hulseanum* (Torr. & Gray) Torr. ex. Champl. Note 12
29. Corolla (so far as is known) pale purple to violet, at least when fresh, 15–25 mm. long (in *A. Buchii*?); carpels pauciovulate. Flowers solitary in the axils. Species known only from Hispaniola (30). Note 13
30. Calyx-lobes more or less cordate; stipules 6–15 mm. long; carpels 11–13, about 15 mm. long (31).
30. Calyx-lobes not cordate; stipules not more than 7 (8?) mm. long; carpels fewer (32).
31. Stems without long hairs; calyx-lobes conspicuously cordate; carpel-beaks divergent. *A. inclusum* Urban
31. Stems with numerous, very long, spreading, simple hairs; calyx-lobes subcordate; carpel-beaks erect. *A. Leonardi* Urban. Note 14
32. Carpels 6, barely 10 mm. long; calyx-lobes ovate-lanceolate, acuminate.
. *A. Picardae* Urban
32. Carpels 9 or 10; calyx-lobes triangular-lanceolate. Herbage velutinous, white or whitish, the stems with long, very fine, simple hairs (33).
33. Stipules 6–7 (8?) mm. long. Carpels scarcely 10 mm. long, rather obtusely beaked. *A. Buchii* Urban
33. Stipules 4–5 mm. long. Calyx-lobes obtusish; mature fruit unknown.
. *A. haitense* Urban. Note 15

34. Plants annual. Stems up to about 1 m. high; herbage more or less tomentose; leaves large, broadly ovate or suborbicular, abruptly acuminate; petals about 10 mm. long, yellow; carpels long-aristate, pluriovulate. Naturalized in the United States and Bermuda from India.....
.....*A. Theophrasti* Medic. Note 16
34. Plants perennial, often more or less woody (35).
35. Leaves (the upper ones) sessile or nearly so, amplexicaul; carpels pluriovulate. Stems loosely pilose or villous; leaves ovate, cordate with usually overlapping basal lobes; flowers mostly in terminal panicles; carpels about 12, inflated, the walls membranous. Mexico.....
.....*A. amplexifolium* (Moç. & Sessé ex DC.) G. Don. Note 17
35. Leaves all distinctly petiolate; carpels (except rarely in *A. Palmeri*?) pauciovulate (36).
36. Petals usually becoming reflexed. Plants herbaceous or shrubby, up to 6 m. high; herbage velutinous, the stems and (or) petioles often also with long, spreading, simple hairs; leaves broadly ovate or suborbicular, more or less cordate, sometimes slightly lobed; flowers in a (usually ample) terminal panicle; flower-buds angulate-turbinate; corolla yellow or whitish, often with a red or purple center, the petals 9-15 mm. long; carpels 8-14 (16?), villous, 10-15 mm. long, usually shortly aristate but sometimes muticous and rounded or truncate at apex; seeds pubescent. West Indies and southern Mexico to northern South America.....*A. giganteum* (Jacq.) Sweet. Note 18
36. Petals (so far as is known) not becoming reflexed (37).
37. Stipules up to 15 mm. long, about 1/3 as wide as long at base, auriculate on one side. Flowers solitary or subpaniculate apically; petals 10-13 mm. long, deep yellow; carpels about 10, apiculate, 1.5-2 times as long as the calyx. Perhaps in western Mexico and in Martinique; introduced from the Old World.....
.....*A. auritum* (Wall. ex Link) Sweet. Note 19
37. Stipules smaller or narrower, not auriculate (38).
38. Fruiting calyx (except sometimes in *A. Dugesii* and *A. Hemsleyanum*) not more than 2/3 as long as the mature fruit (39).
38. Fruiting calyx (except occasionally in *A. Palmeri* and perhaps *A. hirtum*) from more than 2/3 as long as to longer than the mature fruit (48).
39. Carpels muticous to subaristate. Flowers in very open panicles (40).
39. Carpels long-beaked or aristate (44).
40. Plants shrubby; petals 12-15 mm. long. Carpels villous (41).
40. Plants herbaceous; petals not more than 12 mm. long. Leaves large, suborbicular, deeply cordate, strongly discolorous; flowers in ample panicles (42).
41. Carpels 8 or 9, muticous or very shortly beaked, 10 mm. long, thin-walled, somewhat inflated. Flowers in an ample panicle. Southern Mexico...
.....*A. Andrieuxii* Hemsl. Note 20
41. Carpels 10 or 11, obtuse or apiculate at apex, firm-walled, not inflated. Stems densely tomentulose, sometimes (in var. *longipilum* Standl.) also with long, simple hairs. El Salvador. . . *A. Calderoni* Standl. Note 21

42. Stems glabrous or tomentulose; leaves not or obscurely trilobate; petals 10-12 mm. long; carpels obtuse and muticous to mucronate at apex. Southern Arizona and Mexico.....*A. reventum* Wats.
42. Stems conspicuously pubescent; leaves often shallowly trilobate; petals less than 10 (mostly 6-7) mm. long; carpels mucronate to shortly aristate (43).
43. Petioles and stems sparsely to copiously hirsute with long, simple or few-armed hairs. Southern Arizona and Mexico.....*A. sonorae* Gray
43. Petioles and stems without such hairs, densely white-lanate. Southern Baja California.....*A. Carterae* Kearney
44. Inflorescence paniculate or subumbellate. Petals 8-10 mm. long (45).
44. Inflorescence otherwise, the flowers solitary in the axils, sometimes somewhat crowded apically (46).
45. Leaves mostly long-petiolate and distinctly cordate, often shallowly trilobate; carpels 6-8 (9?) mm. long, 5-7 in number, shortly aristate, the awns spreading. West Indies and Mexico to South America.....
.....*A. umbellatum* (L.) Sweet
45. Leaves (the upper ones) short-petiolate and rounded or subcordate at base; carpels (8?) 13-14 mm. long, stellate-hispid, long-aristate. Flowers numerous, in dense axillary clusters, the inflorescence an elongate, leafy or nearly naked thyrse. Mexico. . *A. Hemsleyanum* Rose. Note 22
46. Herbage, calyx, and carpels with glandular hairs. Petals 6-10 mm. long, little to considerably surpassing the angulate-plicate calyx; carpels aristate. Southern Mexico, including Baja California and Tres Marias Islands.....*A. Dugesii* Wats. Note 23
46. Herbage, calyx, and carpels not or very obscurely glandular (47).
47. Stem-hairs all short and stellate; leaves not or only moderately discolored; calyx-lobes overlapping and subcordate at base; petals 6-15 mm. long. Southern Arizona and Mexico, including Baja California.....
.....*A. californicum* Benth. Note 24
47. Stem-hairs partly long, simple, very fine, reflexed; leaves strongly discolored, velutinous on both surfaces, coarsely crenate-dentate, sometimes shallowly trilobate; calyx-lobes not overlapping or cordate; petals about 10 mm. long. Southern Arizona.....*A. Parishii* Wats.
48. Carpels numerous (12-30), remaining attached to the axis after maturity by a dorsal thread (Note 25). Leaves obtuse to shortly acuminate. Old World species, more or less naturalized in tropical and subtropical America (49).
48. Carpels fewer, or without attaching threads. Indigenous species (51).
49. Herbage with glandular hairs, the stems also with long, spreading, simple hairs; petals 15-20 mm. long, orange- or tawny-yellow, with a red or purple basal spot. Carpels thin-walled, muticous or apiculate; seeds puberulent. Florida, West Indies, Mexico, Nicaragua.....
.....*A. hirtum* (Lam.) Sweet. Note 26
49. Herbage without glandular hairs; petals commonly less than 15 mm. long, yellow. Stems usually with long, spreading, simple hairs (50).

50. Fruit stellate-tomentose, the carpels mucicous to cuspidate, thin-walled, inflated; seeds puberulent, pubescent at the hilum. Leaves usually coarsely dentate. Florida, West Indies, and probably elsewhere in tropical America. *A. indicum* (L.) Sweet. Note 27
50. Fruit villous, the carpels cuspidate; seeds tuberculate, otherwise glabrous. West Indies. *A. leiospermum* Griseb. Note 28
51. Corolla (in *A. Gaumeri?*, *A. sphaerostaminum?*) usually less than 15 mm. long (52).
51. Corolla usually 15 mm. or longer (58).
52. Carpels biovulate, rounded and usually mucronate at apex, about 7 mm. long, densely tomentose dorsally; herbage tomentose with stellate hairs, yellowish or rusty or appearing so in old specimens; leaves mostly entire, rounded or subcordate at base, obtuse to short-acuminate at apex, thickish, the veins more or less prominent beneath. Yucatan *A. Gaumeri* Standl. Note 29
52. Carpels normally triovulate, long-beaked or subaristate, more than 7 mm. long; herbage (except in old specimens) not appearing yellowish or rusty; leaves crenulate to dentate (53).
53. Inflorescence an elongate, almost naked, often long-branched panicle. Herbage velutinous; leaves broadly ovate, deeply cordate, rather abruptly long-acuminate, denticulate or dentate, sometimes shallowly trilobate; petals about 8 mm. long. Southern Baja California. *A. Xanti* Gray
53. Inflorescence otherwise but sometimes racemose or subpaniculate apically in *A. Palmeri* (54).
54. Calyx-lobes subcordate and overlapping at base, at least in the bud (55).
54. Calyx-lobes not subcordate. Seeds usually minutely tuberculate or echinulate (57).
55. Leaves with a very long and sharp acumination; carpels mucronate or cuspidate. Plants suffruticose; leaves broadly ovate, deeply cordate, denticulate, strongly discolorous; carpels 14 or fewer, tomentose; seeds tuberculate-pilosulous. Southern Mexico. *A. sphaerostaminum* Hochr. Note 30
55. Leaves acute to shortly (rarely long-) acuminate; carpels more or less aristate (56).
56. Flowers mostly solitary in the axils; petals 6-15 mm. long. Southern Arizona and Mexico, including Baja California. *A. californicum* Benth.
56. Flowers axillary and also racemosely or subcorymbosely clustered at ends of the stem and of more or less elongate axillary branchlets, the inflorescence, when well developed, a very open, leafy panicle; petals 10-15 mm. long. Southern Florida, southern Texas, West Indies, Mexico; Columbia. *A. abutiloides* (Jacq.) Garcke. Note 31
57. Herbage usually rather roughly pubescent; leaves concolorous or nearly so, crenate or dentate, often shallowly trilobate, truncate or shallowly (rarely deeply) cordate at base; flowers in subumbellate, axillary and terminal clusters, the whole inflorescence a leafy panicle; petals usually about 8 mm. long. West Indies and Mexico to South America. *A. umbellatum* (L.) Sweet

57. Herbage finely soft-pubescent; leaves discolorous, crenulate (exceptionally dentate?), deeply cordate at base; flowers axillary and in subcorymbose terminal clusters; petals 12 mm. or longer. Florida, West Indies, and perhaps in southern Mexico, Guatemala, and Honduras
..... *A. permolle* (Willd.) Sweet
58. Stems with few or many long, spreading, simple hairs in addition to other pubescence (59).
58. Stems without such hairs (62).
59. Calyx-lobes lanceolate or ovate-lanceolate, attenuate-acuminate. Stems erect to procumbent; leaves broadly ovate or suborbicular, cordate; flowers solitary in the axils; calyx cleft nearly to the base, accrescent, in fruit 15–25 mm. long; petals 15–20 mm. long; carpels 12–15 mm. long, conspicuously aristate, villous. Texas, southeastern New Mexico, and northern Mexico. *A. Wrightii* Gray. Note 32
59. Calyx-lobes ovate-deltoid, obtuse to acuminate (60).
60. Leaves ovate-lanceolate, cordate-subsagittate, less than $\frac{1}{2}$ as wide as long. Calyx cleft nearly to the base, the lobes overlapping. Northeastern Mexico. *A. subsagittatum* Hochr.
60. Leaves broader, not at all sagittate (61).
61. Calyx finely and densely puberulent, with a few long hairs at base, the lobes broadly deltoid and overlapping at base; flowers more or less crowded at apex of the stem and branches; herbage more or less glandular; leaves discolorous, puberulent above, velutinous beneath, ovate, acuminate, cordate with a narrow sinus. Southern Mexico.
..... *A. simulans* Rose
61. Calyx tomentose or villous, the lobes deltoid-ovate, not overlapping; flowers solitary in the axils but, by reduction of the upper leaves, the whole inflorescence often appearing as an elongate, few-flowered terminal raceme, or subpaniculate; herbage not or very obscurely glandular; leaves seldom conspicuously discolorous, velutinous on both surfaces, broadly ovate or suborbicular, cordate, normally acute or shortly acuminate, rather coarsely dentate, sometimes slightly 3-lobed. Petals rich orange, 15–25 mm. long; carpels 8–10 mm. long, cuspidate or shortly aristate. Southern Arizona, southeastern California, northwestern Mexico, and throughout Baja California.
..... *A. Palmeri* Gray. Note 33
62. Leaves small (up to 5 cm. long), obtuse to shortly acuminate, crenulate, sometimes obscurely trilobate, moderately discolorous; carpels cuspidate. Calyx about $\frac{1}{2}$ as long as the corolla, its lobes deltoid and somewhat overlapping at base; plants shrubby. Northeastern Mexico.
..... *A. glabriflorum* Hochr. Note 34
62. Leaves mostly larger, attenuate-acuminate; carpels long-beaked or aristate (63).
63. Calyx very accrescent, often much surpassing the fruit, the lobes broadly ovate, attenuate-acuminate. Leaves broadly ovate, cordate, velutinous usually on both surfaces, strongly discolorous; petals up to 25 mm. long; carpels 12–15 mm. long. Texas and eastern Mexico.
..... *A. hypoleucum* Gray

63. Calyx only moderately accrescent, not surpassing the fruit (64).
64. Herbage glandular, especially in the inflorescence; flowers mostly subracemously or subcorymbosely disposed on elongate, leafy, axillary branchlets, the whole inflorescence an open, leafy panicle; leaves long-acuminate, moderately discolored; carpel stellate-tomentose. Central and southern Mexico. *A. Holwayi* Rose. Note 35
64. Herbage not glandular; flowers mostly solitary in the axils or somewhat aggregated at ends of the branches, the inflorescence scarcely paniculate; leaves acute or shortly acuminate, usually conspicuously discolored; carpels villous. Florida, West Indies, and perhaps in southern Mexico, Guatemala, and Honduras. *A. permolle* (Willd.) Sweet

NOTES

1. The following species, stated to have been based upon collections in Mexico, are insufficiently known for inclusion in the key: *A. albidum* Walp., *A. blandum* Fenzl, *A. sessilifolium* Presl. The last is almost certainly *Bogenhardia crispa* (L.) Kearney (*Abutilon crispum* (L.) Medic.), with which Presl himself compared it. *Abutilon lucianum* (DC.) Sweet (*Wissadula luciana* Benth.), a West Indian species, was referred by R. E. Fries (Sv. Vet. Akad. Handl. ser. 2, 434:60) to *Wissadula contracta* (Link) R. E. Fries. Although Urban (Symb. Antill. 5:415) thought that it should be retained in *Abutilon*, it seems more properly to belong to the genus *Wissadula*.

2. The term pauciovulate, as used in this key, signifies that the number of ovules in each carpel is not more than 3, and the term pluriovulate signifies that the number is 4 or more.

3. Apparently related to *A. umbellatum*.

4. Synonyms: *A. triquetrum* (L.) Sweet and perhaps *A. floribundum* Schlecht.

5. Synonym (?): *A. mochisense* Hochr. *Abutilon Pringlei* apparently intergrades with *A. incanum* (see first paragraph 13 of this key) and is probably only subspecifically distinct. A specimen from Cameron County, southern Texas (Mrs. A. M. Davis in 1941, Herbarium Southern Methodist University), is very like Arizona specimens of *A. Pringlei*.

6. Synonyms (fide Standley, Contrib. U. S. Natl. Herb. 23:754): *A. attenuatum* Robins. & Greenm. and perhaps *A. erosum* Schlecht. Specimens from Culiacan and Balboa, Sinaloa (*J. G. Ortega* 5112 and 6007) resemble *A. ellipticum* except that the petals are 15 mm. long and the foliage is more like that of *A. membranaceum*.

7. Synonyms: *A. Nuttallii* Torr. & Gray, *A. ramosissimum* Presl, *A. texense* Torr. & Gray and, perhaps, *A. racemosum* Schlecht.

8. Synonym: *A. pictum* (Gill.) Walp.

9. Based upon *A. macranthum* Peyr., non St. Hil. Given for Guatemala in Standley, Trees & Shrubs Mexico, but not included in Standley & Steyermark's Flora of Guatemala. Peyritsch described the carpels of his *A. macranthum* as "dorso undulato-crispis," this suggesting that it may be a *Bakeridesia*.

10. Color unknown, but presumably yellow, in *A. Gaumeri*, *A. sphaerostaminum*, and *A. subsagittatum*.

11. Standley, in 1945, identified the type specimen as *Robinsonella divergens* Rose & Baker. Standley & Steyermark in Fl. Guatemala (Fieldiana 246:327), however, included *A. pleiopodum* in their key to *Abutilon* although on p. 372 they gave it as a synonym of *R. divergens*. As well as I can make out on the very immature material available, the carpels contain more than one ovule. Also the stamen-column is pubescent, not glabrous as described for *R. divergens* by Roush.

12. Synonyms: *A. pedunculare* Griseb., non H.B.K. (as to the West Indian plants), *A. commutatum* K. Schum., *A. leucophaeum* Hochr. This species is very closely related to *A. pauciflorum* St. Hil., of southern South America, and was treated under that name by Fawcett and Rendle (Fl. Jam. 53:102). They included Mexico in the range but it is not mentioned by Standley in Trees & Shrubs of Mexico. Schumann's name *A. commutatum* (Fl. Bras. 123:405 under *A. pauciflorum*) was taken up by Urban (Symb. Antill. 4:386), who stated that in Puerto Rico the plants reach a height of 4 m. and are shrubby or arborescent, whereas *A. pauciflorum*, in South America, is apparently less woody and of lower stature (see Fl. Bras. 123:404).

13. It is not certain that all of the 5 following Haitian taxa, each of which apparently was described from a single collection, are distinct as species.

14. Urban did not state the number of ovules, but as the 4 related Haitian species are triovulate, the number in *A. Leonardi* is presumably the same. Also, he did not mention the petal color, but a specimen (*Jiménez 2375*) was characterized on the label as having petals of a pale lilac color, although appearing pale orange when dry. This plant was described by Jiménez as a shrub 1.5 m. high, very common in saline soil.

15. Urban (Repert. Sp. Nov. 18:191) described the petals of *A. haitense* as "ex sicco flava," but stated that it is related to the purple-flowered *A. Picardae*.

16. Synonym: *A. Avicennae* Gaertn.

17. The petal color of *A. amplexifolium* is yellow according to De Candolle (Prodr. 1:469) and G. Don (Hist. Dichl. Pl. 1:502).

18. Synonyms: *A. elatum* (Macf.) Griseb. and perhaps *A. confertiflorum* A. Rich. and *A. mexicanum* Presl.

19. *Abutilon Haenkeanum* Presl may be a synonym of *A. auritum*, since Presl compared it with his *A. stipulare*, of the Philippine Islands, which is usually considered a synonym of *A. auritum*. If the type of *A. Haenkeanum* was collected in western Mexico, as stated by Presl, it may have been a casual introduction, as is the case with *A. auritum* in South America. Specimens from Martinique, also, have been referred to *A. auritum*.

20. Synonym: *A. reticulatum* Rose.

21. Although described as a shrub, this seems very close to *A. reventum*.

22. Based on *A. sidoides* Hemsl., non Dalz. & Gibs.

23. Synonym: *A. tultitlanapense* Hochr.

24. Synonym: *A. Lemmoni* Wats.

25. The presence of attaching threads in *A. leiospermum* is assumed because of its relationship to *A. indicum*. The synonymy of this group of Old World species is very confused.

26. Synonym: *A. indicum* var. *hirtum* (Lam.) Griseb.
27. Synonyms (?): *A. Croizatianum* Moscoso, *A. pubescens* (Cav.) Urban, non Moench, *A. subpapyraceum* Hochr.
28. Although not so stated by Grisebach (Fl. Br. W. Ind. p. 79) or by Fawcett & Rendle (Fl. Jam. 53:100), this is presumably of Old World origin. *Sida vesicaria* Cav. (*Abutilon vesicarium* Sweet) was cited as a synonym by Grisebach and (doubtfully) by Fawcett and Rendle. According to Cavanilles (Diss. 2:55), *S. vesicaria* came from Mexico.
29. The corolla of *A. Gaumeri* apparently is unknown.
30. The number of carpels was stated by Hochreutiner as 14, but the number is evidently smaller in some of the fruits on the type specimen. Petals (in a bud on the type specimen) little surpass the calyx.
31. Synonyms: *A. americanum* (L.) Sweet non *A. americanum* Panzer, *A. Berlandieri* Gray, *A. crassifolium* (L'Hér.) G. Don, *A. domingense* Turcz., *A. Jacquini* G. Don, *A. lignosum* (Cav.) G. Don, *A. peraffine* Shuttlew., *A. scabrum* Wats., and perhaps, *A. dentatum* Rose and *A. fragile* Brandeg.
32. *A. Selerianum* Ulbr. was referred by Standley (Contrib. U. S. Nat. Herb. 23:752) to *A. hypoleucum*, but examination of an isotype indicates that it is more like *A. Wrightii*.
33. Synonyms: *A. aurantiacum* S. Wats., non Linden, and *A. Macdougalii* Rose & Standley. According to Gray (Proc. Amer. Acad. 8:289) the carpels are sometimes 4-ovulate.
34. Probably a distinct species, although seemingly related to *A. permolle*.
35. Synonym (fide Standley, *ibid.* p. 755): *A. durangense* Rose & York.

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A NEW SUBSPECIES AND NEW COMBINATIONS IN LUPINUS

BY DAVID B. DUNN¹

Following the study of the genus *Lupinus* for the Flora of Nevada, it was found that several changes were necessary in the nomenclature. These changes are presented here so that the names will be available for the floristic study. A full explanation has been prepared in monographic form but cannot be published in time for the floristic treatment. I wish to express my thanks to Dr. P. A. Munz for assistance in correcting the Latin diagnosis.

Lupinus argenteus Pursh ssp. **argenteus** var. **tenellus** (Dougl. ex G. Don) Dunn, comb. nov. *L. tenellus* Dougl. ex G. Don, Gen. Syst. Dichl. Pl. 2:367 (1832). *L. laxiflorus* var. **tenellus** (Dougl. ex G. Don) T. & G., Fl. N. Amer. 1:377 (1840). *L. laxiflorus* Dougl. ex Lindl., Bot. Reg. t. 1140 (1828), not Agardh or authors since him.

Lupinus arbustus Dougl. in Lindl. ssp. **arbustus** var. **montanus** (Howell) Dunn, comb. nov. *L. laxiflorus* var. **montanus** Howell, Erythea 3:33 (1895). *L. laxiflorus* var. **cognatus** C. P. Sm., Jepson, Man. Fl. Pl. 527 (1925).

Lupinus arbustus ssp. **neolaxiflorus** Dunn, ssp. nov. *L. laxiflorus* Agardh, Syn. Gen. Lup. (1835), in part, not Dougl. ex Lindl. or G. Don. *L. laxiflorus*

¹ Visiting Botanist, Rancho Santa Ana Botanic Garden, Claremont, California.

T. & G., Fl. N. Amer. (1840), in part. Likewise, in manuals covering the flora of the northwestern United States.

Herbae 2-4 dm. altae, perennes, caulibus pluribus, caulibus et foliis ubique parce sericeis; petiolis basalibus 8-13 cm. longis, foliolis 8-10, maximis 2.5-5 cm. longis, 3-7 mm. latis, lineari-ellipticis vel lineari-oblongatis, superficiebus adpresso-pubescentibus; pedunculis 2-8 cm. longis, racemis 7-12 cm. longis, verticillis 8-20 mm. distantibus; floribus 8-10 mm. longis; calycibus bilabiatis, labio superiore 3-4.5 mm. longo, basi gibbis vel calcaribus 0.2-1.4 mm. longis, bracteolis 0.2-0.8 mm. longis; vexillo in canalibus infra labium calycis dorsaliter pubescenti; carina prope acumen minuto-ciliolata supra; seminibus 3-5.

Type: *David Douglas 297*, collected near "the falls of the Columbia" (Celilo Falls), June 20, 1825 (CGE, Cambridge University, Cambridge, England).

Lupinus arbustus ssp. *calcaratus* (Kell.) Dunn, comb. nov. *L. calcaratus* Kell., Proc. Calif. Acad. Sci. 2:195 (1862). *L. laxiflorus* var. *calcaratus* (Kell.) C. P. Sm., Bull. Torr. Bot. Club 51:304 (1924).

Lupinus arbustus ssp. *silvicola* (Heller) Dunn, comb. nov. *L. silvicola* Heller, Muhlenbergia 6:81 (1910). *L. laxiflorus* var. *silvicola* (Heller) C. P. Sm., Jepson, Man. Fl. Pl. Calif. 527 (1925).

Lupinus arbustus ssp. *pseudoparviflorus* (Rydb.) Dunn, comb. nov. *L. pseudoparviflorus* Rydb., Mem. N. Y. Bot. Gard. 1:232 (1900). *L. laxiflorus* var. *pseudoparviflorus* (Rydb.) C. P. Sm. & St. John in St. John, Fl. S. W. Wash. & Adj. Ida. 277 (1937).

Lupinus pusillus Pursh ssp. *intermontanus* (Heller) Dunn, comb. nov. *L. intermontanus* Heller, Muhlenbergia 8:87 (1912). *L. pusillus* var. *intermontanus* (Heller) C. P. Sm., Bull. Torr. Bot. Club 46:408 (1919).

Lupinus pusillus ssp. *rubens* (Rydb.) Dunn, comb. nov. *L. rubens* Rydb., Bull. Torr. Bot. Club 34:45 (1907). *L. odoratus* var. *rubens* (Rydb.) Jepson, Fl. Calif. 2:282 (1936).

A RANGE EXTENSION FOR *ALLOCARYA CUSICKII* IN CALIFORNIA. *Allocarya Cusickii* Greene has been reported in the literature as occurring south in California to Placer County (cf. Jepson's Flora 3:363, -1943). However, from its somewhat extensive distribution in Nevada, as outlined by I. M. Johnston (Contrib. Arn. Arb. 3:63-64, -1932), it might be expected farther south in transmontane California, and such has proven to be the case. There is a specimen in the herbarium of the California Academy of Sciences from near Chalfant, Mono County (*Eastwood & Howell 9550*), and I have collected it from a small colony along a stream just south of Deep Springs Lake, Inyo County (*Raven 6975*). It might be expected in other areas of southeastern California where there is sufficient moisture.—PETER H. RAVEN.

LINARIA DALMATICA IN IDAHO. Dalmatian toadflax, *Linaria dalmatica* (L.) Miller, has been reported as an escape from cultivation in California, Oregon, and Washington (Howell, Leaflet West. Bot. 7: 152). It is a relatively new weed in Idaho. The plant appears to be fairly well established in the panhandle region of the state and is known to occur in Boundary, Kootenai, Latah, and Idaho counties. Our record in the Herbarium of the University of Idaho is as follows: 3.5 miles north of Viola, Latah County, along right-of-way to Highway 95, in heavy bluegrass sod, *James Torell 116*, June 15, 1953. It has also been observed by the same collector in Kootenai County about 1 mile south of Coeur d'Alene near Highway 95. This plant is considered to be a potential weed menace on Idaho ranges and also may cause trouble on cultivated land.—WILLIAM H. BAKER, University of Idaho Herbarium, Moscow.

ERAGROSTIS CURVULA SPONTANEOUS IN CALIFORNIA. On September 5, 1954, J. T. Howell collected a grass along the roadside at Marsh Creek Springs Park, Contra Costa County, which has since proven to be *Eragrostis curvula* (Schrader) Nees (*Howell 30026*). It was apparently reproducing itself there without cultivation, the first record of the plant I have seen from California. According to Beecher Crampton of the Department of Agronomy, University of California at Davis, it has probably been grown experimentally at various places in California and should be useful as a range grass in certain frost-free areas, although it lacks competitive ability.

Another species which is similar and which has also been grown experimentally is *E. chloromelas* Steud. An examination of the African material of that species in the herbarium of the University of California shows that in that species the mature spikelets are darker in color and the pedicels are spreading, whereas in *E. curvula* the pedicels are closely appressed to the branches and the color of the spikelets is paler. A description of *E. curvula* appears in Hitchcock's Manual (ed. 2, p. 168), while *E. chloromelas* is given briefer mention (p. 169) since it is not yet known to grow spontaneously. Both species are indigenous to Africa.—PETER H. RAVEN.

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LEAFLETS *of* WESTERN BOTANY

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LEAFLETS
of
WESTERN BOTANY

A publication devoted particularly to the native and naturalized plants of western North America and to the cultivated plants of California, appearing about four times each year. Subscription, \$2.00 annually. Cost of back files or single numbers furnished on request. Address: John Thomas Howell, California Academy of Sciences, Golden Gate Park, San Francisco 18.

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LEAFL. WEST. BOT.

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JOHN THOMAS HOWELL

ERRATUM

Please replace line 40, page 244, Vol. VII, No. 10, LEAFLETS OF WESTERN BOTANY, with this gummed label:

16. Leaves not lobed or (in *A. Chittendenii* and *A. Pachecoanum*) sometimes

California endemics must be of fundamental concern not only to botanists but to biologists in general.

As a floristic basis for my observations, I selected Jepson's Manual of the Flowering Plants of California (1923-25)* and from it I prepared a catalogue of the various taxa of vascular plants endemic to California. The present paper does not concern any matters of conservation for which the catalogue was primarily prepared, but is given merely as a floristic analysis that might have some systematic and phytogeographic interest.

For reasons outlined below, and except for a brief discussion of endemic genera, I have restricted myself exclusively to the record of the California flora as presented by Jepson in his Manual. That work is the most recent of the two floras that deal with all families of vascular plants within the state, and since most of it was written by Jepson himself, it presents a remarkably consistent treatment of plant entities. Moreover, on the basis of this floristic account, Jepson (1925, pp. 11-14) gave the first statewide enumeration of endemics and presented a phytogeographic analysis of distribution with the designation of ten endemism areas. For these reasons, I believe, Jepson's Manual will always remain the basis for the study of endemism in California, no matter how much the figures may vary — as certainly they will, as taxonomic concepts may change or as phytogeo-

* A Manual of the Flowering Plants of California by Willis Linn Jepson. Pages 1-1238; figures 1-1023. University of California Press, Berkeley and Los Angeles, California.

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ERRATUM

Please replace line 12, page 243, Vol. VII, No. 10, LEAFLETS OF WESTERN BOTANY, with this gummed label:

7. Petals whitish or pinkish (exceptionally pale yellow?) with a conspicuous,

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JOHN THOMAS HOWELL

A TABULATION OF CALIFORNIA ENDEMICS

BY JOHN THOMAS HOWELL

Late in 1954, Dr. Carl Skottsberg invited me to serve under his chairmanship on a subcommittee dealing with plants within the standing Committee on Conservation of the Pacific Science Congress and to report on matters pertinent to the conservation of ferns and seed plants in California. After accepting Dr. Skottsberg's invitation and cogitating on the way in which I might approach the problem, I concluded to base my observations and records chiefly on the many plants peculiar to our region, since endemism is "the most conspicuous feature of the flora of California" (Eastwood, 1947, p. 55) and since the preservation of California endemics must be of fundamental concern not only to botanists but to biologists in general.

As a floristic basis for my observations, I selected Jepson's *Manual of the Flowering Plants of California (1923-25)** and from it I prepared a catalogue of the various taxa of vascular plants endemic to California. The present paper does not concern any matters of conservation for which the catalogue was primarily prepared, but is given merely as a floristic analysis that might have some systematic and phytogeographic interest.

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* *A Manual of the Flowering Plants of California* by Willis Linn Jepson. Pages 1-1238; figures 1-1023. University of California Press, Berkeley and Los Angeles, California.

graphic boundaries of the California flora may replace Jepson's political limits. Jepson, however, after stating that the total number of endemic species is 1416, gave no analysis of this figure, so impressively large for a continental flora. Believing that a systematic numerical analysis of endemism in California will be of interest to students of the California flora, I am presenting herewith what Jepson's Manual, by means of my catalogue, has disclosed.

In preparing my catalogue, I adhered most literally to the distributional data given by the Manual, and, except in a very few instances, every plant has been catalogued as a California endemic if Jepson's data indicate a distribution within the state of California. Thus, I enumerate as a California endemic *Pogogyne ziziphoroides* Benth., although I know from my own research that this mint occurs in southern Oregon (Howell, 1931, p. 127); and I exclude from my catalogue *Eriogonum angulosum* Benth., to which Jepson (1923, p. 305) assigns an extended distribution through the western United States, although I myself would recognize the plant as endemic (Howell, 1946, p. 273). However, I exclude from the catalogue and analysis such a plant as *Botrychium Lunaria* (L.) Swartz, reported by Jepson (1923, p. 25) as having a localized California occurrence, because the authorship of the name alone indicates a wider distribution.

Whereas Jepson states that 1416 species are endemic, the total number of species which I have catalogued is 1440. This somewhat larger figure has perhaps been arrived at by my too literal acceptance of distributional data as given in the Manual; but, since in my listing I endeavored to be as objective as possible, I did not regard it my privilege to accept or reject a name except on the basis of the Manual's distributional data.

Although Jepson refers many hundreds of plants (probably in excess of 2000) to varietal status, he neither gives their total nor does he indicate the extent of endemism found among them. In my catalogue I have listed 1160 varieties as endemic, the names being accepted in the same objective way in which I accepted species. In preparing my analysis of the number of varieties, I have distinguished the variety that is part of an endemic species from the variety which is part of a species not entirely endemic.

Jepson gives no account of genera endemic to California, probably because he felt that anyone interested in this aspect

of floristic phytogeography could peruse the pages of the Manual and find out for himself! Abrams (1923-51), on the other hand, has entered under each genus its general distribution, those having restricted ranges in the Pacific states being so indicated. Abrams, however, interprets a "California endemic" on a phyto-geographic rather than political basis; and it is in this way that Miss Eastwood (1947) approached the problem of endemism among California genera. Although I regard Dr. Abrams' and Miss Eastwood's approach more correct and preferable, yet in regard to genera I here follow the political limits indicated by Jepson for his Manual: "the region covered by this Manual, the state of California" (1925, p. 11).

According to Jepson's Manual, the number of genera endemic to California is 33. This does not include such mainly Californian genera as *Sequoia* or *Adenostoma*, the first of which is recorded as ranging "to the Oregon line" (1923, p. 55), the second "s. to L. Cal." (1925, p. 503). However, out of the 33 genera one would accept as California endemics in the Manual, 13 are now known to occur beyond the state boundaries, thus leaving only 20 strictly restricted endemic genera. These are as follows:

ODONTOSTOMUM Torr.	LYNOTHAMNUS Gray	HOLOCARPHA Greene
GILMANIA Cov. ¹	OREONANA Jeps.	HOLOZONIA Greene
(<i>Phyllogonum</i> Cov.)	SOLANOA Greene ²	MONOLOPIA DC.
HOLLISTERIA Wats.	DRAPERIA Torr.	NICOLLETIA Gray
TROPIDOCARPUM Hook.	ACANTHOMINTHA Gray	PHALACROSERIS Gray
SEDELLA Britt. & Rose	BLENNOSPERMA Less.	VENEGASIA DC.
CARPENTERIA Torr.	BLEPHARIZONIA Greene	WHITNEYA Gray

The following are the genera that are known to occur beyond California:

BLOOMERIA Kell.	CONGDONIA Jeps. ³	PICKERINGIA Nutt.
APHANISMA Nutt.	HASSEANTHUS Rose	LEMMONIA Gray
ISOMERIS Nutt.	JEPSONIA Small	MOHAVEA Gray
OXYSTYLIS Torr. & Frem.	OSMARONIA Greene	ANISOCOMA Gray
		HEMIZONELLA Gray

¹ The genus *Phyllogonum* is reported from "southern Nevada" by Tidestrom (1925, p. 159), but I have seen no record to substantiate this extension of range. More than a decade after publication of Tidestrom's work, Coville (1936, pp. 209-213) gave a detailed account of collections known to him, and all came from the east-central Death Valley area.

² *Solanoa*, recognized as an endemic California genus both by Jepson (1939, vol. 3, p. 107) and by Abrams (1951, vol. 3, p. 374), has been reduced to a subgenus of *Asclepias* by Woodson (1941, p. 207; 1954, p. 176). I concur with Woodson's opinion.

³ Moran (1950, pp. 62, 63) has discussed the type specimen of *Sedum pinetorum* Bdg. on which *Congdonia* rests, and after indicating that it may have originated in Mexico, concludes that "until the plant is rediscovered . . . its occurrence in California can be considered doubtful."

The following genera, not given in Jepson's Manual, will be numbered among those restricted to California if they are accounted acceptable (as I presently believe them to be):

SEQUIADENDRON Buchholz	HETEROGAURA Rothrock	OROCHAENACTIS Cov.
ECTOSPERMA Swallen	CROCKERIA Greene	PSEUDOBABIA
NEOSTAFFIA Davy	EASTWOODIA Brandegee	(Gray) Rydb.
		TRACYNIA Blake

Thus it would appear that there are 29 genera endemic to California (or more properly only 28, allowing for the transfer of *Solanoa* to *Asclepias*).

In the following pages is my analysis of endemic species and varieties arranged by family. From this it will be seen that *Compositae* are far in the lead in total number of taxa, 435, while the following are those families with 100 or more: *Leguminosae*, 227; *Scrophulariaceae*, 170; *Liliaceae*, 127; *Polygonaceae*, 104; and *Onagraceae*, 100. On the other hand, *Gramineae*, one of California's largest families, have only 43 endemic taxa.

Those genera having 20 or more endemic taxa are specially noted under their family. In this regard *Lupinus* with 78 taxa is the largest; followed by *Eriogonum* with 62, *Astragalus* with 52, *Phacelia* with 51, and *Potentilla* with 49. *Astragalus* with 37 species has the largest number of endemic *species* of any genus in California. *Carex*, which is the largest genus in California, can boast of only 24 endemic species.

Although there are notable concentrations of endemic species in the families listed above, as well as in such other families as *Caryophyllaceae*, *Cruciferae*, *Umbelliferae*, *Polemoniaceae*, and others, one of the impressive features disclosed by the analysis is the large number of families in which endemism occurs. In all, 102 families (out of 142 treated by Jepson) are listed, 11 with only endemic varieties, but 91 with 1 or many species. Some of those families with only one endemic species are especially noteworthy, as for example, *Taxodiaceae* with *Sequoiadendron giganteum*, *Calycanthaceae* with *Calycanthus occidentalis*, *Staphyleaceae* with *Staphylea Bolanderi*, and *Thymelaeaceae* with *Dirca occidentalis*. Several generations of botanists have known that the California flora exhibits a high degree of endemism, and the present analysis graphically portrays how that endemism pervades the flora from the ferns to the sunflowers.

In order to facilitate the printing of the table, I have identi-

fied the figure columns by letters which may be explained as follows:

A, number of endemic species.

B, number of varieties in endemic species (not counting typical varieties).

C, number of endemic varieties (including typical varieties) when entire species is not endemic.

D, total endemic taxa in each family or genus.

The figures pertaining to the tribes of *Compositae* and to the genera are given in italics.

FAMILY & GENUS	A	B	C	D
Ophioglossaceae	1	...	2	3
Polypodiaceae	9	3	7	19
Equisetaceae	1	3	5	9
Selaginellaceae	2	...	2	4
Isoetaceae	3	1	1	5
Pinaceae	8	...	4	12
Taxodiaceae	1	...	...	1
Cupressaceae	7	2	...	9
Taxaceae	2	...	...	2
Naiadaceae	...	...	2	2
Alismaceae	2	...	...	2
Gramineae	32	...	11	43
Cyperaceae	29	...	3	32
<i>Carex</i>	24	...	...	24
Palmaceae	1	...	...	1
Juncaceae	5	...	12	17
Liliaceae	83	25	19	127
<i>Allium</i>	17	5	7	29
<i>Brodiaea</i>	14	5	2	21
<i>Calochortus</i>	19	8	2	29
Amaryllidaceae	1	...	...	1
Iridaceae	3	...	2	5
Orchidaceae	3	1	1	5
Salicaceae	2	2	17	21
Betulaceae	...	...	1	1
Corylaceae	...	...	1	1
Fagaceae	8	9	10	27
<i>Quercus</i>	6	8	9	23
Juglandaceae	2	...	...	2
Myricaceae	1	...	...	1
Urticaceae	1	...	2	3
Loranthaceae	...	...	4	4
Aristolochiaceae	2	...	...	2

FAMILY & GENUS	A	B	C	D
Polygonaceae	68	13	23	104
<i>Chorizanthe</i>	23	7	...	30
<i>Eriogonum</i>	34	6	22	62
Chenopodiaceae	15	3	3	21
Nyctaginaceae	7	3	7	17
Aizoaceae	1	...	...	1
Portulacaceae	9	...	3	12
Caryophyllaceae	23	8	6	37
Ranunculaceae	22	13	17	52
<i>Delphinium</i>	9	9	2	20
Calycanthaceae	1	...	...	1
Berberidaceae	3	...	1	4
Papaveraceae	8	6	11	25
Fumariaceae	4	...	...	4
Capparidaceae	3	1	...	4
Cruciferae	46	17	20	83
<i>Streptanthus</i>	19	7	...	26
Crassulaceae	11	7	3	21
Saxifragaceae	26	11	17	54
<i>Ribes</i>	11	7	10	28
Platanaceae	1	...	...	1
Rosaceae	21	13	41	85
<i>Potentilla</i>	22	10	17	49
Leguminosae	100	43	84	227
<i>Astragalus</i>	37	2	13	52
<i>Lotus</i>	10	10	7	27
<i>Lupinus</i>	26	18	34	78
<i>Trifolium</i>	11	9	21	41
Linaceae	6	...	1	7
Geraniaceae	1	1	...	2
Limnanthaceae	3	...	...	3
Polygalaceae	...	...	1	1
Euphorbiaceae	6	2	6	14
Callitrichaceae	1	1	1	3
Rutaceae	...	...	1	1
Anacardiaceae	3	...	1	4
Celastraceae	...	...	1	1
Staphyleaceae	1	...	...	1
Aceraceae	...	...	1	1
Sapindaceae	1	...	...	1
Rhamnaceae	22	13	18	53
<i>Ceanothus</i>	19	10	13	42
Vitaceae	2	...	...	2
Malvaceae	28	7	1	36
Sterculiaceae	1	...	1	2
Hypericaceae	2	...	1	3
Elatinaceae	1	...	...	1
Frankeniaceae	...	...	1	1

FAMILY & GENUS	A	B	C	D
Cistaceae	2	1	...	3
Violaceae	3	2	2	7
Loasaceae	6	3	2	11
Cactaceae	9	3	...	12
Thymelaeaceae	1	...	...	1
Lythraceae	2	...	...	2
Onagraceae	39	24	37	100
<i>Godetia</i>	14	8	14	36
<i>Oenothera</i>	6	5	15	26
Umbelliferae	61	17	17	95
<i>Lomatium</i>	15	8	3	26
Garryaceae	3	...	1	4
Cornaceae	2	...	2	4
Lennoaceae	1	...	...	1
Ericaceae	23	7	2	32
<i>Arctostaphylos</i>	19	6	...	25
Primulaceae	5	3	3	11
Plumbaginaceae	...	...	2	2
Styracaceae	...	...	2	2
Oleaceae	1	...	...	1
Gentianaceae	8	...	2	10
Apocynaceae	1	1	2	4
Asclepiadaceae	3	1	...	4
Convolvulaceae	10	9	...	19
Polemoniaceae	56	23	10	89
<i>Gilia</i>	10	7	4	21
<i>Linanthus</i>	19	6	...	25
Hydrophyllaceae	50	11	23	84
<i>Phacelia</i>	30	4	17	51
Boraginaceae	50	23	7	80
<i>Allocarya</i>	19	10	1	30
Verbenaceae	1	...	...	1
Labiatae	56	26	10	92
<i>Monardella</i>	17	16	4	37
Solanaceae	7	3	...	10
Scrophulariaceae	101	32	37	170
<i>Collinsia</i>	11	3	6	20
<i>Mimulus</i>	19	1	5	25
<i>Orthocarpus</i>	15	3	9	27
<i>Penstemon</i>	15	7	9	31
Martyniaceae	1	...	...	1
Orobanchaceae	2	...	3	5
Plantaginaceae	5	2	...	7
Rubiaceae	11	4	2	17
Caprifoliaceae	2	...	2	4
Valerianaceae	4	...	1	5
Cucurbitaceae	5	1	...	6

FAMILY & GENUS	A	B	C	D
Campanulaceae	3	...	1	4
Lobeliaceae	8	1	5	14
Compositae	229	85	121	435
<i>Cichorieae</i>	27	12	19	58
<i>Mutisieae</i>	1	...	...	1
<i>Eupatorieae</i>	2	...	2	4
<i>Astereae</i>	55	25	45	125
<i>Inuleae</i>	9	3	10	22
<i>Heliantheae</i>	21	6	1	28
<i>Madieae</i>	42	17	5	64
<i>Ambrosieae</i>	3	...	2	5
<i>Helenieae</i>	35	15	16	66
<i>Eriophyllum</i>	9	4	9	22
<i>Anthemideae</i>	3	...	2	5
<i>Senecioneae</i>	20	3	16	39
<i>Senecio</i>	13	2	10	25
<i>Cynareae</i>	11	4	3	18
TOTAL	1440	493	667	2600

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SOME PUTATIVE CALIFORNIA HYBRIDS
IN ARCTOSTAPHYLOS

BY JOHN THOMAS HOWELL

1. WITH ARCTOSTAPHYLOS SENSITIVA

On Feb. 28, 1954, while walking along the fire road on Throckmorton Ridge, Mt. Tamalpais, Marin Co., I was attracted by a shrub growing in a thicket of *Arctostaphylos* (*Schizococcus*) *sensitiva* Jeps. that looked slightly different from the other plants with which it was closely associated. An examination disclosed that the individual was undoubtedly a hybrid between *A. sensitiva* and the very different and quite unrelated *A. Cushingiana* Eastw. which grew on the other side of the road. No other plant like the presumed hybrid has been found, either at the place where it was growing or at many other places on Mt. Tamalpais where the putative parent species grow together.

The plant which I detected is quite like *A. sensitiva* in its substrictly erect habit, in the shape, color, and texture of its leaves, and in its small corollas. It also corresponds with *A. sensitiva* in the non-foliaceous bracts of its inflorescence and in the closely appressed sepals, while the examination of the base of its trunk disclosed no burl such as is formed in *A. Cushingiana*. On the other hand, the plant is like *A. Cushingiana* in the fine pilose hairs that clothe the branchlets, petioles, and inflorescence-rachises, in the hairy pedicels, in the presence of stomata on the upper leaf-surface, and, most important of all, in its 5-merous (not 4-merous) flowers. Subsequent examination indicated that no fruit was set in 1954. Although there is no close relation between this Mt. Tamalpais hybrid and *A. Edmundsii* J. T. Howell of Monterey Co., it is interesting to note that in the superficial aspect of foliage and in the size and shape of leaves, the two kinds of manzanitas are almost indistinguishable.

2. WITH ARCTOSTAPHYLOS NUMMULARIA

The discovery of a supposed hybrid between a species of *Arctostaphylos* proper and a member of the group separated by Miss Eastwood as the genus *Schizococcus* has led me to look for other putative hybrids between species of the two groups. The earliest record I know of in the literature is the one reported by Miss Eastwood between *Schizococcus nummularius* (Gray) Eastw. and *A. setosissima* Eastw., based on *Eastwood 11458*, collected June

28, 1922, at Mendocino City, Mendocino Co. She described the apparent hybrid as follows: "It has the small leaves and habit of *S. nummularius* but the hairy stems and pubescence of *A. setosissima*. The few fruits on the specimens are those of *Schizococcus* and contain five seeds" (Leaff. West. Bot. 2:50,—1937).

An examination of Miss Eastwood's specimen discloses a plant intermediate in appearance between *A. nummularia* and *A. setosissima*, with the pubescence, leaf-texture, and stomatal pattern of the latter, but with smaller and broader leaves. The size and shape of the leaves are reminiscent of small-leaved forms of *A. columbiana* Piper, a species from which *A. setosissima* is probably at most only varietally distinct. The inflorescence of the Mendocino hybrid is more like that of *A. setosissima*, but it is reduced in all its parts, and the fruit is also much smaller. The flower-pattern, however, is that of *A. nummularia*, the flowers being 4-merous.

3. WITH ARCTOSTAPHYLOS NISSENA

From the Sierra Nevada near Placerville, Eldorado Co., I recorded, in 1936, the occurrence of an apparent hybrid between *A. (Schizococcus) nissenana* C. H. Merriam and *A. viscida* Parry when I published the first description of the flowers and fruits of the former (Leaff. West. Bot. 1: 234). This probable hybrid, which has been recollected at the same station by G. Thomas Robbins (*No. 1483*), is very like *A. viscida* in general appearance, differing chiefly in the pubescence and in the somewhat smaller leaves, as well as in the pubescent ovary.

While there can be little doubt that this *viscida*-like shrub represents a plant that originated through hybridization between *A. nissenana* and *A. viscida*, Jepson (Fl. Calif. 3: 38) suggests that the type of *A. nissenana* itself may have originated through hybridization between *A. viscida* and what he has designated as *A. nissenana* var. *arcana*. Jepson's suggestion may be correct, particularly if *Robbins 1838* is typical *A. nissenana*, as Robbins has determined it. This specimen of Robbins, collected on Fruit Ridge, 3 miles east of Placerville, is noted as having been "a solitary plant amongst a dense stand of *A. viscida*," and, although it appears to have the technical characters associated with *A. nissenana*, it has the larger paler leaves of *A. viscida*. Further field work will be needed to establish the exact charac-

ter of *A. nissenana*, but it now appears likely that its type may have been from a plant of hybrid origin.

4. WITH ARCTOSTAPHYLOS MYRTIFOLIA

In May, 1954, I went to the chaparral-covered hills between Ione and Buena Vista, Amador Co., to search for *A. Helleri* Eastw., because, it occurred to me, that it, too, might be a plant of hybrid origin, with *A. myrtifolia* Parry as one parent. *Arctostaphylos Helleri* has been known only from the type-collection, *Heller 15859*, found in bud and early bloom on Jan. 29, 1941, about 3 miles southeast of Ione, "in a very dense growth of other manzanitas, especially *A. viscida* Parry." In the field, I thought that I had succeeded when I discovered a shrub with slender branches, small leaves, and small fruits, growing in the midst of *A. viscida*; but back in the Academy, a comparison of my Ione plant with the type of *A. Helleri* showed that I did not have that plant. My plant was quite like *A. viscida* in all characters except size and delicacy of parts, while *A. Helleri*, also a plant with slender branches and small leaves, differed in important details of pubescence as well as in general aspect. However, I believe that my Ione plant may represent a hybrid between *A. viscida* and *A. myrtifolia*, both of which were common in the immediate vicinity.

On the other hand, I still believe that *A. Helleri* may be a plant that originated through hybridization, not between *A. myrtifolia* and *A. viscida*, but perhaps between *A. myrtifolia* and *A. Manzanita* Parry, the other widespread species found in the Ione hills. Although an unusual area like that which is adjacent to Ione could boast a second endemic manzanita as remarkable as *A. myrtifolia*, yet the fact that *A. Helleri* has been seen growing only once causes one to consider critically the possible character of its specificity.

As Miss Eastwood has pointed out in her original description, *A. Helleri* seems to be related to such Coast Range species as *A. Hookeri* G. Don, *A. franciscana* Eastw., and *A. densiflora* M. S. Baker, three small-leaved species that in turn are closely related to the larger-leaved *A. Manzanita* of Coast Range and Sierra foothills. The type of *A. Helleri* discloses a plant that resembles *A. Manzanita* in shape and texture of leaves, longer internodes, glabrous or slightly pubescent stems and leaves, finely ciliate bracts and bractlets, and very sparsely hairy ovary. The type resembles *A. myrtifolia* in the slender branches, small

leaves, and small corollas. With little persuasion, I can readily believe that the larger, coarser structures of *A. Manzanita* could be reduced and minimized by the genetic infiltration of *myrtifolia*-like delicacy, so as to produce just such a creation as *A. Helleri*. Would that I could see it—a provocative plant that must yet be rediscovered and studied as it grows!

PLANT NOTES FROM NAPA COUNTY, CALIFORNIA

BY PETER H. RAVEN

During the past few years, I collected somewhat extensively in Napa County, California, and, since the collection has been recently mounted and added to the Herbarium of the California Academy of Sciences, I would like to report here on some of the more interesting plants. The numbers in parentheses are my field numbers. In most cases, the collections will simply be mentioned in order to supply additional records for plants which have not been reported too often from this area.

INTRODUCED OR WEEDY PLANTS

ELODEA CANADENSIS Michx. In a pool near Conn Creek east of Yountville (4110), where it probably represents a local escape from cultivation.

HELEOCHLOA SCHOENOIDES (L.) Host. Common on the strand of the reservoir in Conn Valley (3936). Also seen along Eticuera Creek on October 28, 1951. Spreading in similar situations in interior northern California.

LEERSIA ORYZOIDES (L.) Swartz. Banks of Conn Creek east of Yountville (5175). It may be native or introduced at this station.

POA BULBOSA L. Grassland of a small pasture in the hills along Tulucay Creek, elevation about 750 feet (5280). Common in Lake County just to the north; seemingly becoming more common throughout California.

SPINACIA OLERACEA L. The garden spinach was found as a local escape from cultivation along the streets of Napa (3038). It was not well established here.

HERNIARIA CINEREA DC. Dry hillside in the "crater region" east of Mt. St. Helena (2911).

DELPHINIUM AJACIS L. Waste places about Napa (3007); near a farm on the road between Capell Valley and Wooden Valley (3092). It seems to become established near where it is planted, but does not appear capable of assuming a competitive status in the native vegetation.

DESCURAINIA SOPHIA (L.) Webb. Weed along the railroad tracks at Yountville (5361).

LUNARIA ANNUA L. A vigorous colony along the highway just south of Calistoga (2032). This colony was examined in 1950, when the collection was made, and again in 1953, when it was found to be quite persistent.

PRUNUS CERASIFERA Ehrh. Occasionally spreading by underground parts, as along the road between Napa and Browns Valley (3012). This widely cultivated plum is but one of a series of fruit trees which sometimes tend to become established near orchards where they are planted. They do not seem to be an important factor in the flora.

VICIA SALAMINIA Heldr. & Sart., vel aff. Near a small farm, near the top of the Wooden Valley Grade (3063). This is the plant discussed by J. T. Howell (Marin Flora, p. 177-8). It seems close to the plant described under this name by Boissier (Flora Orientalis 2:591), but without authentic material of the species for comparison, it is not possible definitely to identify our Californian plant.

TAMARIX TETRANDBRA Pallas. Established along Eticuera Creek (3952). This is probably the plant cited by Jepson (Fl. Calif. 2:513) as *T. gallica* from White Sulphur Creek, Napa County, and is the plant naturalized along Putah Creek in the valley east of Middletown, Lake County (*M. S. Baker 8129*). For a discussion of the cultivated species of *Tamarix*, see the article by Miss E. McClintock: "Studies in California Ornamental Plants. 3. The Tamarisks" (Journ. Calif. Hort. Soc. 12:76-83, -1951).

OLEA EUROPAEA L. Often seen in Napa County in brush or woodland miles from any present-day buildings, and thus perhaps spread by birds. Unless one were familiar with the local flora, it would be impossible to tell whether these plants are native or not, in many cases.

LYCIUM HALIMIFOLIUM Mill. Common weed in vacant lots around Napa (3885).

LYCOPERSICON ESCULENTUM Mill. The common tomato is found abundantly established in some places near farms, as in

a roadside ditch 1.5 miles east of Yountville (5170), where it was both common and rank.

PETUNIA VIOLACEA Lindl. Occasionally established in the vicinity of gardens, as at Lokoya (3848) and about Napa.

KICKXIA SPURIA (L.) Dumort. This plant was found to be one of the most common weeds of Napa County, occurring throughout Napa and Berryessa valleys, and also found in the vicinity of Wooden and Capell valleys. Representative collections: Conn Creek 3 miles east of Rutherford (2809); 1 mile north of Napa (4094).

CALENDULA ARVENSIS L. Roadside in Browns Valley (3014). This has been known in California as a wild plant only from Sonoma and Santa Barbara counties. *Calendula officinalis* L. is common in gardens and persists as a weed in waste places in Napa County.

RECORDS OF NATIVE PLANTS

ECHINODORUS CORDIFOLIUS (L.) Griseb. Common on strand of reservoir in Conn Valley (3934).

STIPA CERNUA Stebbins & Love. Dry hillside on Pope Creek east of Samuels Springs, elevation about 300 feet (5332, with G. Ledyard Stebbins). Growing with *S. pulchra* Hitchc., but that species preferred the better soil while the present one grew in rocky places, although they were often in close proximity. In *S. cernua* the leaf-blades were narrow, glaucous, and somewhat involute, and the plants had not yet sent forth fully developed panicles on April 19, 1953. The plants of *S. pulchra*, on the other hand, had wider, greener leaf-blades and were in full anthesis on this date. *Stipa lepida* Hitchc. grew on the rocky, wooded slopes high above the creek, several hundred feet above the other two.

JUNCUS ENSIFOLIUS Wiks. "Crater region" east of Mt. St. Helena, June 10, 1951 (without number). This station helps to connect that in the Mt. Hamilton Range (cf. H. K. Sharsmith, *Am. Midl. Nat.* 34:331,—1945) with those to the north.

ERIOGONUM UMBELLATUM Torr. subsp. *STELLATUM* (Benth.) Stokes. Brushy slope in "crater region" east of Mt. St. Helena (2932).

GLINUS LOTOIDES Loeffl. Fairly common on the strand of the reservoir in Conn Valley (3931) with *Ammannia coccinea* Rottb. (3939) and *Boisduvalia glabella* (Nutt.) Walp. var. *campestris* (Jeps.) Jeps. (3940).

PHACELIA NEMORALIS Greene. Wooded, moist slope near Recor Dam (4154).

CORDYLANTHUS MOLLIS Gray. Colonies in low places with *Salicornia* and *Distichlis*, salt marshes near Bentley Wharf, on the lower Napa River (5138).

ECLIPTA ALBA Hassk. Locally common on the strand of the reservoir in Conn Valley (3941).

NOTES ON MALVACEAE VI

BY THOMAS H. KEARNEY

Hibiscus Hitchcockii Ulbr., spec. nov. Frutex usque ad 1.8 m. altus; ramis juvenilibus, foliis, pedunculis, involucellis, et calycibus minute stellato-tomentosis; foliorum laminis suborbicularibus, breviter 3-5-lobatis, lobis latis, rotundatis, parce crenatis, laminis basi subcordatis vel truncatis, apice obtusissimis, paulo discoloribus; pedunculis usque ad 9.5 cm. longis; involu-cello quam calyce brevior vel subaequilongo, phyllis 8 vel 9 composito, phyllis distinctis, conduplicativis, e basi subcylindrico in laminam ovatam, breviter acuminatam, fere 10 mm. latam expansis; calyce campanulato, profunde partito, lobis lanceolatis vel ovato-lanceolatis, attenuato-acuminatis, valde 5-nervatis, eglandulosis; petalis suberectis, roseis, 6-7 cm. longis; tubo stamineo quam stylo multum brevior; stylo elongato, ramis brevibus, clavatis; capsula ovoidea, 2-2.5 cm. longa, calycem aequanti vel paulo brevior, valvis valde cuspidatis, extus puberulis fere lepidotis; seminibus dense lanatis.

Additional characters to be noted are: stems sparingly branched above; leaves (only the uppermost preserved) with petioles about $\frac{1}{3}$ as long as the blades, the latter at least 11 cm. long, slightly wider than long, with or without a shallow, open, basal sinus, rather sparsely pubescent then glabrescent above, densely and finely stellate-tomentose beneath; flowers solitary in the upper axils or subcorymbosely clustered at apex of the stem and branches; involu-cel-bractlets 12-18 mm. long, thickish, the conduplicate blade much longer than the nearly cylindric, stalk-like, basal portion; calyx at anthesis 19-22 mm. long, only slightly accrescent, cleft nearly to the base, the acuminate thickish lobes without a gland on the midrib; corolla funnel-form-campanulate, the petals scurfy-puberulent externally; stamen-tube about $\frac{3}{5}$ as long as the style, the latter shorter than the petals; capsule-valves very sharp-pointed, the rigid cusps about 4 mm. long, the capsules sparsely villous within on the dissepiments with long, fine, simple hairs; seeds (immature) about 6 mm. long.

Type, in the Gray Herbarium, collected by A. S. Hitchcock (No. 20114) between Guyaquil and Salinas, Prov. Guayas, Ecuador, lat. about 2°S., alt. 0-100 m., June, 1923, a specimen with an old flower and nearly mature capsules. Also collected by H. E. Stork (Goodspeed Exped. No. 11421, in University of Cali-

fornia and Gray herbaria) between Canchaque and Serran, Depto. Piura, Prov. Huancabamba, Peru, lat. about 5°S., alt. 450 m., in alluvial soil in "shrubwood," April 6, 1939, reported common, specimens with flowers only. The species is known only by these two collections.

This very distinct species was named but apparently never published by the late Prof. Dr. E. Ulbrich. The Stork collection was identified by Ivan M. Johnston. *Hibiscus Hitchcockii* differs from any other species of *Hibiscus* known to me in the shape of the leaves, which is not unlike that of certain species of *Pelargonium*. The characters of the involucl suggest relationship to *H. sororius* L. f., which was placed by Hochreutiner in his revision of *Hibiscus* (Ann. Conserv. et Jard. Bot. Genève 4:166, 167) in his section *Spatula*, but he characterized this section as having glabrous seeds. *Hibiscus Hitchcockii*, however, differs from *H. sororius* in many characters, some of which may be summarized as follows:

	H. HITCHCOCKII	H. SORORIUS
Leaves:	Shallowly 3-5-lobed with broad, rounded lobes, margin sparingly crenate	Not lobed, at most slightly angulate, margin crenulate
Stems:	Minutely stellate-tomentose	Stellate-hirsutulous
Bractlets of involucl:	Two-thirds as long as to nearly equaling the calyx, somewhat gradually expanded from the subcylindric stalk into a much longer, ovate, acuminate blade	Less than half as long as the calyx, the subcylindric stalk abruptly dilated into a rounded, subreniform blade, this shorter than the stalk
Calyx-lobes:	Attenuate-acuminate	Obtuse or acutish
Petals:	6-7 cm. long	3.5-6 cm. long
Capsules:	Scurfy-puberulent externally	Hirsute externally
Seeds:	Densely lanate	Minutely tuberculate, otherwise glabrous

FIORIA, Mattei. This genus was published by G. E. Mattei in 1917 (Bol. R. Orto Bot. Palermo, n. s. 2:68-74). It corresponds with Garcke's Section *Pterocarpus* of *Hibiscus*, which was characterized by Hochreutiner in his revision of that genus (Ann. Conserv. et Jardin Bot. Genève 4:168-171) as having 5-angulate-alate, scarios capsules. Mattei (ibid.) in raising this section to the status of a genus, observed (translated): Intermediate between *Hibiscus* and *Kosteletzkya*, agreeing with the former in

having several ovules in each locule of the ovary (but with occasional reduction to one seed by abortion), and with the latter in having the carpels disarticulating at maturity. He summarized the characters of these related genera as follows (translated):

1. Valves of the fruit not separating from the receptacle, and forming a true capsule with polyspermous locules..... HIBISCUS
1. Valves separating from the receptacle, not forming a capsule, the locules oligospermous or monospermous (2).
2. Fruit not or scarcely depressed, glabrescent, the valves high-alate laterally, the locules oligospermous¹ or rarely by abortion monospermous....
..... FIORIA
2. Fruit strongly depressed-orbicular or 5-lobate, hispid at least on the angles, the valves not or only slightly alate, the locules always monospermous KOSTELETZKYA

Three species were included by Hochreutiner (*ibid.*) in *Hibiscus* sect. *Pterocarpus*: *H. vitifolius* L., *H. dictyocarpus* (Hochst.) Webb, and *H. purpureus* Forsk. The first two were transferred by Mattei (*ibid.*) to *Fioria* as *F. vitifolia* (L.) Mattei and *F. dictyocarpa* (Hochst.) Mattei. He did not mention *Hibiscus purpureus* but included *Fioria pavonioides* (Fiori) Mattei.

All of these are Old World indigenes. *Fioria vitifolia* is widely distributed in tropical Asia, Africa, and Australia, and is naturalized in several West Indian islands — Cuba, Hispaniola, Jamaica, etc. — perhaps also in Central America. The West Indian plants were placed by Hochreutiner (*ibid.*, p. 169) in his var. *genuinus* forma *americanus*, characterized by aculeate stems, etc. Mattei placed them in forma *americana* (Hochr.) Mattei. It is doubtful, however, that "*americana*" should be regarded as more than a geographical race. The other species of *Fioria* are of much more restricted distribution, in eastern Africa and Arabia.

The carpel-wings were considered by Mattei as aids to dissemination by wind. Hochreutiner (*Candollea* 2:87-90), who did not accept *Fioria* as a genus, regarded them as functioning primarily to promote dehiscence. Whatever, if any, the biological function of the wings may be, the structure and texture of the fruit in *Fioria* is strikingly different from that typical of *Hibiscus*. In *F. vitifolia*, the only species I have had opportunity to examine, the conspicuous, scarios, strongly veined wings, these widening to the apex, afford a character which, on morphological grounds, would seem to justify maintaining *Fioria* as a genus.

¹ Mattei himself stated, however, that in *F. vitifolia* (*ibid.*, p. 72) the locules are "5-6-spermis." The distinction he made between *Fioria* and *Kosteletzkya* in regard to pubescence of the fruits is unimportant.

A TENTATIVE KEY TO THE NORTH AMERICAN SPECIES OF HIBISCUS, L.

BY THOMAS H. KEARNEY

Panama and the West Indies are included. The key is an artificial one and juxtaposition of species does not necessarily indicate close relationship. The segregate genera *Abelmoschus*, Medic. and *Fioria*, Mattei, the latter based upon *Hibiscus vitifolius* L., are excluded. Synonyms are given in the notes at the end of the key. Note 1.

1. Flowers (as described) dioecious. Plants shrubby or arborescent; leaves nearly glabrous, up to 10 cm. long and $\frac{2}{5}$ as wide, elliptic-lanceolate, rounded at base, sharply acuminate, serrate-dentate; flowers borne singly or in small clusters in the axils; involucl shorter than the calyx, of 5 or 6 subulate bractlets; calyx thin and petal-like, 5-lobed nearly to the base; petals of the staminate flowers pale greenish-yellow, about 9 mm. long, the short claws conspicuously long-ciliate; stamens in 5 fascicles at apex of the column, the filaments considerably longer than the anthers, these appearing 2-celled; pistillate flowers apparently apetalous, the thin calyx persistent, somewhat longer than the nearly globular, sparsely pubescent capsule; seeds (immature) 2 in each carpel, long-hairy; styles and stigmas unknown. Mexico (Vera Cruz) *H. Purpusii* T. S. Brandeg. Note 2
1. Flowers perfect (2).
2. Plants arborescent or (usually large) shrubs, litoral; leaves large, broadly ovate or suborbicular, often wider than long, coriaceous, discoloured, abruptly and shortly acuminate, deeply cordate at base, the margins entire or finely crenulate. Bractlets of the involucl 8 or more, united below; flowers large, the petals yellow when fresh (3).
2. Plants not arborescent and litoral, or the leaves otherwise (4).
3. Petals usually less than 8 cm. long, fading greenish; calyx and involucl persistent in fruit; seeds minutely warty, otherwise glabrous. Southern Florida, West Indies, and southern Mexico to South America; Old World Tropics *H. tiliaceus* L. Note 3
3. Petals 9–11 cm. long, fading deep red; calyx and involucl usually deciduous; seeds villous. West Indies and perhaps in southern Florida *H. elatus* Sw. Note 4
4. Mature leaves (some or all of them except sometimes in *H. cannabinus*) palmately lobed to far below the middle, or parted (5).
4. Mature leaves (except sometimes in *H. bifurcatus*, *H. diversifolius*, and *H. furcellatus*) not lobed or less deeply so (11).
5. Fruiting calyx bladder-like, greatly inflated, enclosing the capsule, scarious or thin-membranous, conspicuously nerved. Plants annual; leaves mostly 3–5-parted, the divisions deeply incised, commonly wedge-shaped; bractlets subulate, hirsute; petals 2–4 cm. long, yellow or yellowish with a dark brown or purple basal spot. Escaped or nat-

- uralized here and there in the United States, from the Old World. . . .
 *H. Trionum* L.
5. Fruiting calyx otherwise (6).
6. Calyx (especially in fruit) with conspicuously thickened nerves and margins. Plants herbaceous; bractlets sometimes appendaged or bifurcate at apex. Species introduced from the Old World, scarcely naturalized (7).
6. Calyx (except in *H. aculeatus*) with only moderately thickened nerves and margins. Native species (8).
7. Involucel and calyx becoming fleshy and dark red or purple; herbage glabrous or nearly so; leaf-lobes serrulate or crenulate; calyx-hairs soft and fine, not conspicuously pustular-based; corolla yellow.
 *H. Sabdariffa* L. Note 5
7. Involucel and calyx not becoming fleshy, remaining green; herbage often more or less hispid; leaf-lobes coarsely toothed; calyx-hairs stiff, from a conspicuously pustular base; corolla yellow or occasionally red, with a dark center *H. cannabinus* L. Note 6
8. Herbage glabrous; petals red, long-clawed, 7 cm. or longer. A tall perennial herb. Southeastern United States. *H. coccineus* Walt. Note 7
8. Herbage roughly pubescent; petals yellow or cream-colored, often with a red or purple basal spot, short-clawed. Bractlets and calyx hirsute or hispid (9).
9. Bractlets bifurcate, thick and rigid, hispid with pustular-based hairs, as is the thick calyx; petals 5-8 cm. long; capsules hirsute; seeds glabrous. Leaves mostly 3-5-lobed or -parted, the lobes oblanceolate-cuneate, coarsely few-toothed. Southeastern United States west to southeastern Texas *H. aculeatus* Walt. Note 8
9. Bractlets entire, subulate; petals not more than 4.5 cm. long; capsules glabrous; seeds long-hairy (10).
10. Stems distinctly woody above the caudex, evenly strigose with forked hairs; seeds completely hairy. Western Texas to southern Arizona and Mexico *H. Coulteri* Harv. Note 9
10. Stems scarcely woody above the caudex, typically finely pubescent in 1 or 2 lines, also hispid with simple or forked hairs; seeds naked or nearly so in the center. Southern Arizona and northern Mexico, perhaps also in southwestern Texas *H. biseptus* S. Wats.
11. Bractlets bifurcate, sometimes very unequally or obsoletely so. Plants usually shrubs; calyx-lobes with a more or less conspicuous median gland; petals 5-9 cm. long, pink to crimson (12).
11. Bractlets not bifurcate (14).
12. Stems aculeate-verrucose and usually hispid with long, spreading or retrorse simple hairs; leaves commonly 3-5-lobed, often to below the middle, serrate. Bractlets and calyx hirsute or hispid with long, simple hairs. West Indies and Mexico to South America
 *H. bifurcatus* Cav. Note 10
12. Stems not aculeate but exceptionally more or less setose in *H. furcellatus*; leaves not lobed or shallowly (rarely deeply) angulate-lobed (13).
13. Herbage usually velutinous with very short stellate hairs, occasionally also sparsely setose; bractlets shallowly bifurcate; petals 7-9 cm.

- long. Leaves narrowly ovate to suborbicular. Florida, West Indies, and southern Mexico to South America. . . . *H. furcellatus* Desr. Note 11
13. Herbage rather sparsely hispid with simple or stellate hairs; bractlets deeply bifurcate; petals 5–6.5 cm. long. Cuba, southern Mexico, and Central America *H. costatus* A. Rich.
14. Involucel-bractlets terete, dilated abruptly at apex into a broad, more or less reniform blade. Plants suffrutescent to shrubby; stems hirsutulous with short, stellate hairs; leaves broadly ovate to suborbicular, cordate at base, obtuse, shallowly crenate; calyx much longer than the involucel, with broad, obtuse or acutish lobes; petals erect, 3.5–6 cm. long, purple. Cuba, Central America; South America *H. sororius* L. f. Note 12
14. Involucel-bractlets not so dilated (15).
15. Corolla (in *H. Eggersii*?) tubular or funnellform, the petals erect or spreading only near apex (16).
15. Corolla campanulate or funnellform-campanulate, the petals spreading from well below the apex. Note 13 (29).
16. Herbage and calyx aculeate (17).
16. Herbage and calyx not aculeate (19).
17. Aculei relatively sparse and short, thick, flattened at base; calyx tubular, 4–5 cm. long at anthesis, shortly dentate, very accrescent, up to 13 cm. long in fruit; petals yellow, about twice as long as the calyx at anthesis. Leaves suborbicular, up to at least 25 cm. long and wide, cordate, coarsely and sharply dentate, sometimes shallowly 5–7-lobed; flowers solitary or geminate; peduncles at anthesis 1–3 cm. long; bractlets 7–10, lanceolate or ovate-lanceolate, much shorter than the calyx. Costa Rica; northwestern South America. *H. ferox* Hook.
17. Aculei very numerous, relatively slender, up to 8 mm. long, terete; calyx campanulate, about 3 cm. long, the lobes $\frac{1}{3}$ to nearly $\frac{1}{2}$ as long as the tube; petals pink, about 3 times as long as the calyx. Leaves suborbicular, 5–7-angulate or shallowly lobed, deeply cordate, irregularly sinuate-dentate; androecium nearly equaling to longer than the corolla; mature fruit apparently unknown. Hispaniola (18).
18. Branches soft-pubescent with stellate hairs; leaves up to nearly 30 cm. long; peduncles 3–7 cm. long; bractlets narrow, distinct; androecium equaling or slightly shorter than the corolla. *H. horridus* Urban
18. Branches glabrescent except for the aculei; leaves up to 14 cm. long; peduncles 11–28 cm. long; bractlets broad, more or less connate; androecium longer than the corolla *H. hottensis* Helwig
19. Bractlets spatulate, much shorter than the calyx (20).
19. Bractlets not spatulate but sometimes narrowly oblanceolate (23).
20. Leaves deltoid-lanceolate, long-acuminate, rounded or truncate at base; corolla red, 2 cm. long; androecium exerted. Bractlets about 3 mm. wide. Mexico (Oaxaca) *H. Nelsoni* Rose & Standl.
20. Leaves ovate or broader, acute or shortly acuminate; corolla pink or purple; androecium not or barely exerted (21).
21. Stems conspicuously and densely hispid-tomentose with longish, forked or stellate hairs; leaves more or less quadrate, commonly 3–5-angulate or very shallowly lobed, cordate at base, 10–20 cm. long, often

- wider than long; bractlets 3-4 mm. wide; seeds puberulent. Panama; northern South America *H. verbasciformis* Klotzsch. Note 14
21. Stems not conspicuously pubescent, the hairs relatively short; leaves ovate, not or rarely angulate or lobed, truncate or cordate at base, not more than 10 cm. long; bractlets narrower; seeds covered with long silky hairs. Petals somewhat more spreading than in the 5 preceding species (22).
22. Peduncles not or but little longer than the subtending petioles; corolla 2.5-4 cm. long. West Indies (Jamaica), Mexico, and perhaps in Central America *H. lavateroides* Moric.
22. Peduncles much longer than the subtending petioles; corolla about 4 cm. long. Honduras, El Salvador *H. longipes* Standl. Note 15
23. Androecium exerted; corolla glabrous externally. Bractlets subulate or very narrowly oblanceolate; leaves ovate-lanceolate to broadly ovate, obtuse to acuminate, coarsely crenate-dentate, sometimes subhastately lobed; corolla red; seeds with long, silky hairs. Southern Florida, West Indies, Mexico, Guatemala . . . *H. pilosus* (Sw.) Fawc. & Rendl. Note 16
23. Androecium not exerted; corolla (in *H. Eggersii*?) pubescent externally, mostly with forked or stellate hairs (24).
24. Plants herbaceous; corolla about 3 cm. long, about twice as long as the calyx, dark red. Herbage rather densely stellate-pubescent; leaves broadly ovate, cordate, acutish at apex, dentate; involucrel somewhat shorter than the calyx, the bractlets about 8, lanceolate, united about $\frac{1}{3}$ of their length. Mexico (Nayarit) *H. anisaster* Standl.
24. Plants shrubby or arborescent; corolla 3.5 cm. or longer. Leaves broadly ovate or suborbicular, mostly cordate with an open sinus; flowers solitary in the axils; peduncles stout; calyx cylindrical-campanulate at anthesis, much longer than the involucrel, very pubescent, the lobes broad; capsules hirsute or sericeous (25).
25. Leaves up to 20 (25?) cm. long, angulate or slightly 3-lobed; petals yellow, fading reddish or brownish, 4-6 cm. long, very thick. Herbage velutinous; peduncles commonly 5-10 cm. long; bractlets 9-11, linear-lanceolate, 2-5 mm. wide at base; seeds glabrous. West Indies, Mexico, Guatemala *H. clypeatus* L. Note 17
25. Leaves up to 12 cm. long, more deeply 3-5-lobed; petals brown, dull red, or purple (26).
26. Peduncles about 1 cm. long, not articulated. Herbage stellate-tomentose or tomentellous; petals 5 cm. long, brown-violet. Hispaniola
. *H. brachypus* Urban. Note 18
26. Peduncles much longer, articulated but sometimes obscurely so (27).
27. Bractlets lanceolate, up to 5 mm. wide at base. Leaves shallowly cordate with a very open sinus; calyx-lobes broadly deltoid, foliaceous; corolla 4-5 cm. long. Cuba *H. cryptocarpus* (Walp.) A. Rich. Note 19
27. Bractlets subulate or narrowly lanceolate, not more than 2 mm. wide at base (28).
28. Peduncles articulated near base; leaves deeply cordate, broad, 5-lobed; corolla not described; capsules yellowish-setose. Cuba
. *H. Eggersii* Urban

28. Peduncles articulated above the middle; leaves shallowly cordate or truncate at base, deltoid-ovate, 3-5-lobed with the bluntly acuminate midlobe much the longest, or the upper leaves sometimes lanceolate and merely dentate; corolla brownish, tomentose externally, about 4 cm. long, the petals oblanceolate; capsules densely sericeous with brownish hairs. Bahamas *H. Brittonianus* Kearney. Note 20
29. Herbage more or less aculeate. Plants more or less woody (30).
29. Herbage not aculeate (32).
30. Leaves 2 or more times as long as wide, crenate or crenate-serrate, sometimes subhastately lobed; bractlets 14-18. Petals pink or purple, (6?) 9-11 cm. long; seeds hairy. Honduras, Cuba, Trinidad; South America *H. Lambertianus* H.B.K. Note 21
30. Leaves not or only moderately longer than wide, often palmately lobed, long-petiolate; bractlets 14 or fewer. Calyx hirsute or hispid (31).
31. Petals commonly yellow, sometimes red or purple, 4-5 cm. long; peduncles short, not more than 2 cm. long; bractlets 10 or fewer; calyx with deltoid-lanceolate, acuminate lobes about as long as the tube. Herbage heavily armed, the aculei numerous and sharp; leaves up to 12 cm. long, very diverse in shape, from oblong-ovate to suborbicular or deeply 5-lobed or 5-parted; flowers in terminal, spike-like racemes, the upper leaves much reduced; bractlets linear or narrowly lanceolate. West Indies and Central America; South America; perhaps introduced from the Old World. *H. diversifolius* Jacq. Note 22
31. Petals pink or purple with a dark purple basal spot, mostly more than 7 cm. long; peduncles 3 cm. or longer; bractlets usually 12 or more, linear or narrowly lanceolate, mostly $\frac{1}{2}$ - $\frac{2}{3}$ as long as the calyx; calyx with broad, apically rounded lobes shorter than the tube. Leaves 3- or slightly 5-lobed, truncate or subcordate at base, deeply serrate, hispid on both surfaces, up to 11 cm. long; androecium about $\frac{1}{2}$ as long as the corolla; capsules hispid with yellowish hairs, about $\frac{1}{2}$ as long as the calyx. West Indies; Guiana *H. trilobus* Aubl. Note 23
32. Petals deeply laciniate into numerous oblong or spatulate lobes, pink or crimson. Plants shrubby; leaves ovate to oblong-lanceolate; flowers on very long, slender peduncles; bractlets minute, many times shorter than the tubular, shallowly lobed calyx; androecium slender, greatly surpassing the corolla. An Old World species, often cultivated and escaping or naturalized in Panama and Peru *H. schizopetalus* (Mast.) Hook.f.
32. Petals not laciniate (33).
33. Flowers relatively small, the petals not more than 4 cm. long or perhaps exceptionally 4.5 cm. in *H. cardiophyllus*. Bractlets narrowly linear, lanceolate, or oblanceolate (34).
33. Flowers larger, the petals (except sometimes in *H. syriacus*) more than 4 cm. long (39).
34. Leaves commonly more or less hastately lobed, sparsely pubescent or glabrate; petals yellow or whitish, sometimes drying pink. Stems strigose with few-armed hairs; flowers long-pedunculate; bractlets very narrow, equaling or (usually) longer than the calyx; seeds covered with long, silky hairs (35).

34. Leaves not at all hastate, or the petals not yellow (36).
35. Plants suffruticose or shrubby; calyx about 12 mm. long, $\frac{1}{3}$ - $\frac{1}{2}$ as long as the corolla; capsules strigose-pubescent. Baja California
.....*H. ribifolius* A. Gray. Note 24
35. Plants herbaceous or suffruticose; calyx 15-25 mm. long, about $\frac{1}{2}$ as long as the corolla; capsules glabrous. Northeastern Mexico
.....*H. acicularis* Standl.
36. Bractlets equaling to (usually) much longer than the calyx. Plants suffruticose; herbage rather sparsely pubescent with stiff, appressed, forked hairs, or glabrate; leaves deltoid-ovate or deltoid-lanceolate, truncate, obtuse, or subcuneate at base, crenate-dentate, often subhastately lobed, seldom more than 6 cm. long (Note 25); bractlets commonly 9-11, narrowly linear or filiform; petals 12-20 mm. long, normally crimson; seeds with long, white hairs. West Indies and Mexico to northern South America*H. brasiliensis* L. Note 26
36. Bractlets slightly to much shorter than the calyx (37).
37. Petals yellow with a red basal spot. Plants shrubby; leaves up to 3 cm. long, elliptic to oval or rhombic-ovate, rounded or cuneate at base, rounded or obtuse at apex; calyx-lobes linear-lanceolate; capsules glabrous. Southern Mexico*H. elegans* Standl.
37. Petals pink, red, or purple. Leaves ovate or suborbicular; capsules shorter than the calyx, glabrous or nearly so externally (38).
38. Bractlets 4-7, less than $\frac{1}{2}$ as long as the calyx to nearly obsolete or caducous, narrowly linear; herbage finely and densely stellate-tomentose; plants shrubby or suffruticose; leaves seldom more than 3 cm. long, thick, commonly rounded at both ends; peduncles short; petals lavender, up to 2.5 cm. long; seeds covered with long, silky hairs. Western Texas to southern California and northern Mexico, including Baja California*H. denudatus* Benth. Note 27
38. Bractlets more numerous and persistent, more or less spatulate or oblanceolate, 3-nerved; herbage rather coarsely stellate-tomentose; plants herbaceous or suffruticose; leaves up to 7 cm. long, obtuse at apex, cordate or subcordate at base with an open sinus, sinuate-denticulate, sometimes very shallowly lobed; peduncles often greatly surpassing the subtending leaf; petals deep pink or crimson, 2.5-4 (4.5?) cm. long; seeds shortly pilose. Western and southern Texas and Mexico.....*H. cardiophyllus* A. Gray. Note 28
39. Bractlets ovate, at least 4 mm. wide toward the contracted base, few, usually much shorter than the calyx. Plants shrubby or arborescent; herbage pubescent; stipules large, suborbicular; leaves angulately 5-lobed, deeply cordate at base with a narrow sinus; calyx very deeply cleft; petals pink or white (sometimes yellow?), very pubescent dorsally; seeds lanate. West Indies (Dominica, French Islands)
.....*H. tulipaeiflorus* (Walp.) Hook. Note 29
39. Bractlets narrower (40).
40. Corolla medium sized, not more than 6 cm. long (except sometimes in *H. lunariifolius*). Leaves usually angulate or lobed (41).
40. Corolla (except sometimes in *H. militaris* and *H. Rosa-sinensis*) larger, more than 6 cm. long (42).

41. Plants shrubby or arborescent; leaves rhombic-ovate, more or less cuneate, mostly trilobate; petioles shorter than the blades; herbage glabrous or nearly so; bractlets 6-8, equaling or somewhat longer than the calyx; calyx 35-40 mm. long; petals pink or white, 3-6 cm. long, usually with a darker basal spot; capsules finely pubescent. Escaped from cultivation here and there in North America; native of Asia *H. syriacus* L.
41. Plants herbaceous or suffrutescent; leaves suborbicular (almost quadrate), cordate, 3-5-angulate or shallowly 3-5-lobed; petioles often much longer than the blades; herbage more or less hirsute with short hairs; bractlets 5-10, shorter to somewhat longer than the calyx, lanceolate, strongly nerved, united a little above the base; calyx 10-15 mm. long; petals yellow with a purple basal spot, 5-7 cm. long; capsules hispid. Inflorescence, by reduction of the upper leaves, appearing as an elongate raceme. Jamaica, naturalized from the Old World tropics *H. lunariifolius* Willd.
42. Bractlets 5 or 6, lanceolate, about $\frac{1}{2}$ as long as the calyx; androecium long-exserted. Plants shrubby or arborescent; herbage glabrous or nearly so; petals 6-8 cm. long, glabrous, bright red with a purple basal spot. Extensively cultivated and occasionally escaping in tropical and subtropical America; probably from China. *H. Rosa-sinensis* L.
42. Bractlets more numerous, rarely fewer than 9; androecium (in *H. Urbanii*?) not exserted (43).
43. Plants shrubby; bractlets narrowly lanceolate, 2-3 mm. wide at base, about $\frac{1}{2}$ as long as the calyx. Leaves broadly ovate, subtrilobate, cordate at base, discolorous, whitish-tomentose beneath; petals about 12 cm. long, presumably purple, densely stellate-pubescent dorsally. Cuba *H. Urbanii* Helwig
43. Plants tall, herbaceous perennials; bractlets subulate to filiform. Species (except *H. californicus* and sometimes *H. lasiocarpus*) of the eastern United States (44).
44. Herbage glabrous or nearly so; calyx in fruit accrescent, loose, membranous; capsules glabrous or nearly so within; seeds pubescent (45).
44. Herbage pubescent; calyx otherwise; capsules long-hairy on the dissepiments within; seeds papillate but glabrous (46).
45. Leaves about as wide as long, often rather deeply palmately 3-5-lobed with attenuate-acuminate lobes, not at all hastate, coarsely dentate; calyx up to 5 cm. long at anthesis; petals bright red, 7.5-10 cm. long; capsules glabrous externally. Florida. *H. semilobatus* Chapm. Note 30
45. Leaves less than $\frac{1}{2}$ as wide as long, lanceolate to ovate, mostly hastately 3-5-lobed, crenate or serrate, usually finely so; calyx 2-3.5 cm. long at anthesis; petals pale pink with a purple basal spot, 5-7.5 cm. long; capsules glabrous or puberulent externally. Southern Ontario to Florida and Texas *H. militaris* Cav. Note 31
46. Bractlets conspicuously but sometimes sparsely ciliate with rather long, simple hairs, also minutely stellate-tomentose; capsules rounded or truncate at apex, short-beaked or merely apiculate, densely pubescent externally. Leaves mostly long-acuminate, dentate or crenate,

- sometimes slightly lobed; petals pink or whitish with a crimson basal spot (47).
46. Bractlets not or obscurely ciliate, minutely and very densely tomentose; capsules usually more pointed and longer-beaked (48).
47. Leaves ovate-lanceolate to broadly ovate, truncate, rounded, or sometimes shallowly cordate at base, shallowly to rather deeply crenate; bractlets considerably shorter than to longer than the calyx; petals 6.5–11 cm. long. Indiana to Missouri, south to Florida, Texas, and eastern New Mexico *H. lasiocarpus* Cav. Note 32
47. Leaves broadly deltoid-ovate, distinctly but shallowly cordate at base, coarsely crenate-dentate; bractlets nearly equaling to somewhat longer than the calyx; petals 6–10 cm. long. Central California
..... *H. californicus* Kellogg. Note 33
48. Capsules glabrous externally; leaves rather sparsely puberulent or glabrate above, densely and finely tomentose beneath, strongly discolorous, lanceolate to broadly ovate, often shallowly lobed; bractlets $\frac{1}{2}$ – $\frac{3}{4}$ as long as the calyx. Petals 7–10 cm. long, whitish or pink, usually with a crimson basal spot. Massachusetts to southern Ontario, south to Florida and Texas *H. Moscheutos* L. Note 34
48. Capsules hirsute externally; leaves finely tomentose on both surfaces, slightly to conspicuously discolorous; bractlets about $\frac{1}{2}$ as long as the calyx (49).
49. Petals 12–15 cm. long, pink or purple, sometimes with a crimson basal spot; leaves about as wide as long, deltoid, subhastately and often deeply 3–5-lobed. Coastal Plain of the United States, from Georgia and Florida to Mississippi *H. grandiflorus* Michx.
49. Petals 8–10 cm. long, white, yellow, or pink, with a crimson basal spot; leaves longer than wide, sometimes nearly 3 times longer, not lobed. Coastal Plain, from Maryland to Florida, westward to southeastern Texas *H. incanus* Wendl.

NOTES

1. The following taxa, some of which may not belong to the genus *Hibiscus*, as now restricted, are too poorly known for inclusion in this key: *H. attenuatus* Bosse (North America), *H. bahamensis* Mill. (Bahamas?), *H. biflorus* Turcz. (habitat?), *H. cubensis* A. Rich., *H. fasciculatus* Moç. & Sessé (Mexico), *H. Langloisii* Greene (Louisiana), *H. liliaceus* Amadeo (Puerto Rico), *H. Martinianus* Zucc. (Mexico), *H. membranaceus* Cav. (habitat?), *H. nutans* Sessé & Moç. (Mexico), *H. pedunculatus* Sessé & Moç. (Mexico), *H. Sagraeanus* Mercier (Cuba), *H. tuxtlenensis* Sessé & Moç. (Mexico).

2. *Hibiscus Purpusii* is an anomalous plant, known only by the type collections (*Purpus* 7545, 7546). It has the aspect of certain *Sterculiaceae* and is a very doubtful member of the genus *Hibiscus*, although included therein by Standley (*Contrib. U. S. Natl. Herb.* 23:781).

3. Synonyms: *H. abutiloides* Willd., *H. arboreus* Desv., *H. Azanzae* DC., *H. bracteosus* Moç. & Sessé, *H. circinnatus* Willd., *H. fragrantissimus* Moç. & Sessé, *H. porophyllus* Vell., *Paritium tiliaceum* (L.) A. Juss., etc.

4. Synonyms: *H. tiliaceus* var. *elatus* (Sw.) Hochr., *Paritium elatum* (Sw.) G. Don, and perhaps *Pariti grande* Britton. It is distinguishable from *H.*

tiliaceus by the corolla characters, doubtfully so by the other characters stated in the key.

5. Synonyms: *H. cruentus* Bertol., *H. digitatus* Cav., *H. fraternus* L. f.

6. Synonym: *H. radiatus* Cav., a form with usually appendaged bractlets.

7. Synonym: *H. carolinianus* Muhl. Compare *H. semilobatus*, first paragraph 45 of the key.

8. Synonym: *H. scaber* Michx.

9. Synonym(?): *H. acetosaefolius* Moç. & Sessé ex DC.

10. Two varieties have been described. — Synonyms: *H. bicornis* G. F. W. Meyer, *H. decipiens* St. Hil., *H. fluminensis* Vell., *H. uncinellus* DC.

11. Several varieties have been described. In var. *azuensis* Urban & Helwig, the bractlets were described as "integrae vel subintegrae," but in the type collection they are distinctly although shallowly bifurcate. Synonyms: *H. corylifolius* Presl, *H. Diodon* DC., *H. fraternus* Sessé & Moç. non L. f., *H. multiformis* St. Hil., *H. tomentosus* Stahl non Mill., *H. trilobatus* Vell. non G. F. Gmel.

12. Synonym: *H. crenatus* Splitg. non Vell.

13. *Hibiscus lavateroides* and *H. longipes* (paragraphs 22 of the key) might be sought in this section.

14. Synonym: *H. spathulatus* Garcke, non Gaudichaud.

15. Doubtfully distinct, as a species, from *H. lavateroides*.

16. Synonyms: *H. acetosaefolius* Hemsl. non Moç. & Sessé, *H. achanioides* (Turcz.) Hemsl., *H. Brancroftianus* Macf., *H. cylindraceus* Moç. & Sessé, *H. floridanus* Shuttlew., *H. phoeniceus* Sessé & Moç. non Jacq., *H. Poeppigii* (Schlecht.) Garcke, *H. spiralis* Cav., *H. truncatus* A. Rich., *H. tubiflorus* Moç. & Sessé ex DC. The last was recognized as a species by Standley (Contrib. U. S. Natl. Herb. 23:777, 779) who distinguished it from *H. pilosus* (*H. spiralis*) in having "leaves truncate or subcordate at base, usually shallowly hastate-lobate."

17. Synonyms: *H. Berlandieranus* Moric., *H. tomentosus* Mill.

18. Urban thought this species to be most nearly related to *H. clypeatus*, with which it apparently intergrades.

19. Basonym: *Abelmoschus cryptocarpus* Walp. Described by J. G. Jack as a "slender small tree 20 ft. high, fls. Indian red."

20. Synonym: *H. bahamensis* Britton, non Miller.

21. Collections in Cuba and Trinidad were referred to this species by Urban (Repert. Sp. Nov. 16:33). Synonyms: *H. angustifolius* H. & A., *H. salviaefolius* St. Hil.

22. Three varieties were distinguished by Hochreutiner. Synonyms: *H. agioxillos* Vell., *H. ficulneus* Cav. non L., and perhaps *H. ciliaris* Presl and *H. maculatus* Lam. The last, from the West Indies, was recognized as a species by Urban & Helwig (Repert. Sp. Nov. 24:235) who described the petal-color as violet-purple or wine-red, but gave no other characters to distinguish *H. maculatus* from *H. diversifolius*.

23. Synonyms: *H. aquaticus* Tussac, *H. domingensis* Jacq., *H. trilobatus* J. F. Gmel., and perhaps *H. striatus* Cav. This taxon is not well understood. Urban (Repert. Sp. Nov. 16:34) apparently regarded *H. trilobus* as a form of *H. Lambertianus*.

24. Closely related to *H. Coulteri* and *H. biseptus* (see paragraphs 10 of the key), but the leaves are not, or much more shallowly, lobed.

25. Up to 9 cm. in var. *sylvaticus* (Benth.) Hochr., with more deeply lobed leaves.

26. Synonyms: *H. betulifolius* H. B. K., *H. columbinus* Moç. & Sessé, *H. hirtus* Cav., *H. iochromus* T. S. Brandeg., *H. neglectus* Wright, *H. oxyphyllus* Moç. & Sessé, *H. phoeniceus* Jacq., *H. rigidus* Moç. & Sessé, *H. sylvaticus* Benth., *H. unilateralis* Cav., *H. violaceus* T. S. Brandeg.

27. *H. denudatus* var. *involucellatus* A. Gray (*H. involucellatus* Woot. & Standl.) is a less woody plant with better developed involucels and occupies the eastern part of the range of *H. denudatus*. It is at least a good subspecies.

28. Synonym: *H. lasiocarpus* S. Wats., non Cav.

29. Basonym: *Abelmoschus tulipaeiflorus* Walp. Synonym (?): *H. marmoratus* Lem., described as from Mexico. A specimen from Santiago de las Vegas, Cuba (*C. F. Baker 102*) was described by the collector as "a large openly spreading shrub 12-15 feet high with an abundance of large rose-pink flowers." Although not so stated on the label, it was probably from a cultivated plant.

30. Synonyms: *H. coccineus* Walt. var. *integrifolius* Chapm., *H. integrifolius* (Chapm.) Small. Compare first paragraph 8.

31. Synonyms: *H. hastatus* Michx. non L. f., *H. virginicus* Walt. non L., and *H. coccineus* var. *virginicus* (Walt.) Hochr.

32. Synonyms: *H. grandiflorus* Torr. non Michx., *H. platanoides* Greene.

33. Synonym: *H. lasiocarpus* var. *occidentalis* (Torr.) A. Gray. Perhaps only subspecifically distinct from *H. lasiocarpus*.

34. Synonyms: *H. oculiroseus* Britton, *H. opulifolius* Greene, *H. palustris* L., *H. Moscheutos* subsp. *palustris* R. T. Clausen, *H. pinetorum* Greene. *Hibiscus palustris* was recognized as a distinct species by Deam (*Fl. Indiana* p. 669) and by Fernald (*Gray's Man.* ed. 8 pp. 1005, 1006) but the characters they give for distinguishing it from *H. Moscheutos* seem inadequate. Fernald added "perhaps better as a geographic variety."

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PROGRESS VS. FLORA. Many plants, both native and introduced, formerly recorded as growing without cultivation, have not been re-collected recently. This is certainly the case in Arizona, the region with which I am best acquainted, and is doubtless so everywhere. Of course, this elimination has been going on ever since man reached the agricultural stage of civilization, but it has been accelerated tremendously in recent decades by the great improvement of earth-moving machinery. Such operations as leveling land, widening roads, construction of irrigation works, and logging off forests have destroyed many stations where plants once grew wild.

In view of the rapid increase of the human population, no reasonable person would oppose these developments, but they make it more than ever imperative to guard zealously those portions of our national and state parks and forests that have been set aside for the protection of plant and animal wild life.

Naturally, it cannot be concluded, from the destruction of the station or stations where a certain plant was known to have grown formerly, that it has disappeared entirely from the area. There is always the possibility that new stations will be discovered. Consequently, in writing an account of a state or other local flora, all such apparently exterminated plants should be included, noting, however, the fact that they have not been observed recently.—T. H. KEARNEY.

LEAFLETS *of* WESTERN BOTANY

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LEONTODON AUTUMNALIS IN ALASKA
AND WASHINGTON

BY S. F. BLAKE

Agricultural Research Service, Beltsville, Md.

Fall dandelion or "arnica," *Leontodon autumnalis* L., so well established in New England, has never penetrated as far south as some of its more aggressive relatives in the genus *Hieracium* such as *H. pilosella* and *H. pratense*. Although widespread in Europe, it is scarce or lacking in the Mediterranean area, and appears to be definitely a plant of temperate and cold regions. In the 8th edition of Gray's Manual (1950) Fernald assigns a range from Newfoundland to Pennsylvania, west to western Ontario and Michigan. Gleason, in *The New Britton and Brown Illustrated Flora* (1952), extends this range in all possible directions, reporting the plant from New Jersey to Greenland, rarely inland to Michigan and even Montana. It is not listed in Rydberg's *Flora of the Rocky Mountains and Adjacent Plains*, in Jepson's *Manual of the Flowering Plants of California*, or in Peck's *Manual of the Higher Plants of Oregon*. The only records known to me from the Pacific Coast are by Piper, in his *Flora of the State of Washington* (1906), and by Muenscher in his *Flora of Whatcom County, Washington* (1941).

Piper's record was based on a single collection, *Piper 750*, now in the herbarium of the State College of Washington, from which I have been able to borrow it through the kindness of Dr. Marion Ownbey and Sherman J. Preece, Jr. The sheet bears a single good-sized specimen with young heads collected by Piper at Seattle, 22 June 1889, which is in fact *Hypochaeris radicata* L., as which it has been identified at some earlier date by Dr. G. N. Jones.

Muenscher's record (as *Apargia autumnale* Hoffm.) was based on his *No. 8443* and *8892*, both collected in 1937 and lent for examination from the Wiegand Herbarium at Ithaca through the kindness of Dr. R. T. Clausen; a duplicate of *8892* was also lent me from the herbarium of the State College of Washington. *No. 8892*, from Ten Mile, is *Hypochaeris glabra* L., but *No. 8443*, from Bellingham, is *Leontodon autumnalis*, and appears to be the only collection actually of that species on record from any of the Pacific Coast states.

The species has not been reported from Alaska, so far as I can ascertain, but it occurs in a small but interesting gathering of plants made by Dr. Eugene A. Hollowell, of the former Division of Forage Crops (now Forage and Range Section), U. S. Department of Agriculture, and H. J. Hodgson, of the Agricultural Experiment Station at Palmer, Alaska, in a trip taken in 1953 covering much of Alaska, from Circle south to Homer. The collection (their *No.* 35), made at Fairbanks on 3 July 1953, consists of 3 specimens. One of these is typical *L. autumnalis* L., with the involucre very thinly pilose, especially toward base, with subappressed very slender whitish hairs; the other specimens have the involucres more or less hirsute with stiff spreading blackish-green hairs, but not nearly so densely so as in specimens in the U. S. National Herbarium from Newfoundland and Maine referred to var. *pratensis* (Link) Koch, and they seem best left in *L. autumnalis*, which is sufficiently variable in this respect. The material will be placed in the United States National Herbarium and the Gray Herbarium.

PLANT RECORDS FOR WASHINGTON

BY WALTER J. EYERDAM

Seattle, Washington

CORYNEPHORUS CANESCENS (L.) Beauv. Along railroad right-of-way near Sand Point, $\frac{1}{4}$ mile west of Lake Washington, King Co., *No.* 6616. Determined by X. M. Gaines. New to Washington.

CAREX SUBFUSCA W. Boott. Fifteen miles north of Olympia, Thurston Co., *No.* 1724, July 20, 1937. Determined by F. J. Hermann. New to Washington.

SPIRANTHES PORRIFOLIA Lindl. In a small lake, Mt. Ellinor, Mason Co., *No.* 1229, Aug. 14, 1937. First record for Olympic Peninsula.

VERONICA CHAMAEDRYIS L. On edge of woods, $\frac{1}{2}$ mile northeast of Seattle, King Co., *No.* 6583, May 30, 1949. Determined by X. M. Gaines. New to Washington.

VERONICA FILIFORMIS Smith. On edge of woods, $\frac{1}{2}$ mile northeast of Seattle, King Co., *No.* 6581, May 30, 1949. Determined by X. M. Gaines. New to Washington.

THE STATUS AND DISTRIBUTION OF CAREX DANAENSIS STACEY

BY F. J. HERMANN

U. S. Department of Agriculture, Beltsville, Maryland

One of the rarest sedges of North America is *Carex incurviformis* Mack., which was known to Mackenzie only from the type collection from the Canadian Rockies, near Banff, Alberta (*Macoun*, July 31, 1891), at the time he described it in Rydberg's *Flora of the Rocky Mountains* (1917). Two additional collections had been seen by him when he next treated the species in 1931 (*North American Flora* 18: 30), an undated Drummond specimen, from which the drawing was made for *North American Cariceae*, and a Hooker collection in the Torrey Herbarium lacking both date and locality. The Drummond collection Mackenzie evidently ascribed to British Columbia, judging from the statement in his monograph that the species occurs "on alpine peaks of the Canadian Rockies, in Alberta and British Columbia," although the only legend borne on the label is "Rocky Mts."

On July 3, 1954, Professor W. A. Weber discovered what appeared to be a fourth station for *Carex incurviformis* and to represent the first record for the United States. This was on rocky ledges at the head of Wheeler Lake, about 12,200 ft. alt., at the upper end of Platte Gulch north of Mount Lincoln, Park Co., Colorado, where it was quite inconspicuous in tufts of moss (*Weber 8745*). Examination of the specimen, however, showed that the lower pistillate scales were broader and more blunt than those of the Canadian plants and were more broadly hyaline-margined. This at once suggested the closely allied Californian *C. danaensis*, proposed by the late J. W. Stacey in 1939 (*Leaf. West. Bot.* 2: 166). Mr. Stacey differentiated the two by the following key:

- Perigynia with many slender, impressed nerves on both sides; pistillate scales lance-ovate, narrowly hyaline-margined, acuminate or acute
.....*C. incurviformis*
- Perigynia with several raised nerves on both sides; pistillate scales broadly ovate, widely hyaline-margined, obtuse.....*C. danaensis*
- The nerves of the perigynia in the Colorado material were obviously raised rather than impressed, but so were they in a topotype of *C. incurviformis* (*G. F. Ledingham 1*, Mt. Rundle, Banff,

Aug. 4, 1940). And, curiously enough, there was no mention of impressed nerves in the original description of *C. incurviformis* (where the perigynia are described as "finely conspicuously many-nerved") but only in Mackenzie's later description, so that a re-examination of the known collections of both plants seemed desirable.

Through the courtesy of Dr. David Keck the material of *C. incurviformis* at the New York Botanical Garden, consisting of the type specimen and the two additional collections already referred to, was secured on loan, and Mr. Howell generously sent on the fine representation of *C. danaensis* from the California Academy of Sciences. As suspected, it was found that the perigynia in the three collections of *C. incurviformis* are impressed between the nerves but the nerves themselves are not impressed (as they are, for instance, in such a species as *C. hyalinolepis* Steud.), but elevated. The fundamental distinction upon which *C. danaensis* was erected, then, is non-existent, and despite a tendency for the nerves of its perigynium to be less pronounced or conspicuous only toward the base, the extant material of *C. incurviformis* is too meager to conclude that the same tendency may not apply to it. The difference in the pistillate scales although unstable is nevertheless real: in *C. danaensis* they are predominantly broadly ovate, obtuse, and broadly hyaline-margined throughout the spikes, whereas in *C. incurviformis* they are chiefly lanceolate-ovate, acute and narrowly hyaline-margined except that one to few of the lowermost tend to be of the *C. danaensis* type. In view of the apparent lack of any completely stable characteristic by which the two plants may be distinguished it seems preferable to treat the plant of California and Colorado as *Carex incurviformis* Mack. var. *danaensis* (Stacey) comb. nov. (*C. danaensis* Stacey, Leaflet West. Bot. 2: 166,—1939).

Known from only a single station at the time of its description as a species, var. *danaensis* is now represented by eight California collections in the Herbarium of the California Academy of Sciences, as follows:

TUOLUMNE COUNTY: Mt. Dana, 12,500 ft., *J. T. Howell 14546* (type); west slope of saddle between Twin Peaks, alt. 12,200 ft., *C. W. Sharsmith 4136*; Mt. Conness, about 12,300 ft., *J. T. Howell 20561*; forming turf-like patches among boulders at about 12,000 ft., Mt. Dana, *J. T. Howell 21517*.

INYO COUNTY: abundant on unglaciated plateau on north side of Mt. Humphreys, alt. 12,880 ft., *C. W. Sharsmith 3108*; Mono Mesa, about 12,000 ft., *J. T. Howell 22700*; Army Pass, 12,000 ft., *J. T. Howell 26071*.

TULARE COUNTY: Cirque Peak, 12,000 ft., J. T. Howell 26172.

The Colorado collection already cited notably extends the range of the variety and represents the ninth station known for it up to the present.

NOTES ON MALVACEAE VII: A NEW VARIETY IN MALACOTHAMNUS

BY THOMAS H. KEARNEY

In a paper entitled "The Genus *Malacothamnus*, Greene" (Leaff. West. Bot. 6: 113-140), I indicated in the key (p. 117) that *M. Palmeri* (S. Wats.) Greene is unique in this genus in having densely subcapitate, terminal inflorescences that are closely subtended by bracts. In addition to the two varieties that were described in the earlier paper (ibid., pp. 117, 120, 121), *M. Palmeri* var. *Palmeri* and *M. Palmeri* var. *involutratus* (Robinson) Kearney, a third variety has been discovered recently in the Santa Lucia Mountains by John Thomas Howell. This is:

Malacothamnus Palmeri var. *lucianus*, var. nov. Frutex ramosus usque ad 1.2 m. altus; folia plerumque distincte cordata, utrinque pubescentia pilis stellatis pauciradiatis; a *M. Palmeri* var. *Palmeri* et *M. Palmeri* var. *involutrato* bracteis inflorescentiae et bracteolis involucelli multum angustioribus differt.

The new variety resembles var. *Palmeri* in the rather copiously pubescent upper leaf-surface and relatively narrow bracts and bractlets, but approaches var. *involutratus* in the usually distinctly cordate leaf-bases. The bracts and bractlets are narrower than in either of the varieties previously described, the bracts being not more than 2.5 mm. wide and tapering at both ends, and the bractlets of the involucl being subulate and about 0.5 mm. wide. It should be noted, however, that 2 or 3 of the outermost bracts of the inflorescence are much broader and deeply dentate. These may be regarded as marking a transition to the foliage leaves. The shallowly notched carpels are much as in var. *involutratus*, but too few fruiting specimens of the *M. Palmeri* complex are available to warrant placing much emphasis on this character. The new variety was found at a higher elevation, ca. 3600 feet, than the other varieties are known to attain.

Known only from one station on the Arroyo Seco Road, 3

miles from Escondido Camp, Santa Lucia Mountains, Monterey County (*J. T. Howell 30128, 30642*), the latter the type collection (Herb. Calif. Acad. Sci. 396,251). The first collection, with fruits and withered flowers, was made on November 3, 1954, whereas the type collection, in full flower, was obtained on July 8, 1955. Mr. Howell reported that the plants grew rather abundantly on sandstone rocks, in chaparral composed of *Quercus dumosa*, *Umbellularia*, *Adenostoma*, *Photinia*, *Prunus ilicifolia*, *Ceanothus ramulosus*, and *Arctostaphylos glandulosa* var. He described the petal color as pinkish-violet and the odor of the herbage as unpleasant, like that of rancid grease. It is not known whether the other varieties of *M. Palmeri* have this disagreeable odor. Most species of *Malacothamnus* have pleasantly fragrant herbage.

THE DISTRIBUTION OF BLENNOSPERMA AND OF NICOLLETIA. In my recent account of endemism in California (Leaflet West. Bot. 7: 257-264), I erroneously listed *Blennosperma* Less. and *Nicolletia* Gray among the "strictly restricted endemic genera" (p. 259), *i.e.*, among those found only within the state boundaries. Actually these two genera of *Compositae* range far beyond California, although both are represented in the state by endemic species. *Blennosperma*, a genus of three species, is found in Chile (*B. chilense* Less., the type of the genus) as well as in California [*B. nanum* (Hook.) Blake and *B. Bakeri* Heiser]. *Nicolletia*, also a genus of three species, is restricted to North America, where it is accorded the following rather extended distribution by Rydberg (N. Amer. Fl. 34: 179, 180): western Texas, New Mexico, Chihuahua, and Coahuila (*N. Edwardsii* Gray); southern California (*N. occidentalis* Gray); Baja California (*N. trifida* Rydb.).

The deletion of these genera from those listed reduces by two the totals that I gave on pages 259 and 260. Thus according to my corrected count, the "strictly restricted endemic genera" of California that I believe should be accepted total 26.—J. T. HOWELL.

ERRATA

Page 4, line 15 should read: flora with the finding of this curious parasitic plant on sand.

Page 9, line 1: for *V. arizona* read *V. arizonica*.

Page 15, line 1: for money-flower read monkey-flower.

Page 15, line 33: for Perennial herb read Annual herb.

Page 57, line 2: for has read have.

Page 135, line 13: for Swip read Swamp.

Page 137, line 35: for parvioribus read minoribus.

Page 194, line 34 should read: 6600 ft., April 24, 1939, Percy Train 2630; type in Herb. Na-.

Page 197, line 6: for Argentina read Chile.

Page 213, lines 38, 39, 40: for NEMOPHILIA read NEMOPHILA.

Page 243, line 12 should read: 7. Petals whitish or pinkish (exceptionally pale yellow?) with a conspicuous.

Page 244, line 40 should read: 16. Leaves not lobed or (in *A. Chittendenii* and *A. Pachecoanum*) sometimes.

Page 249, line 42: for Columbia read Colombia.

Page 259, line 24: delete NICOLLETIA Gray.

Page 259, line 26: delete BLENNOSPERMA Less.

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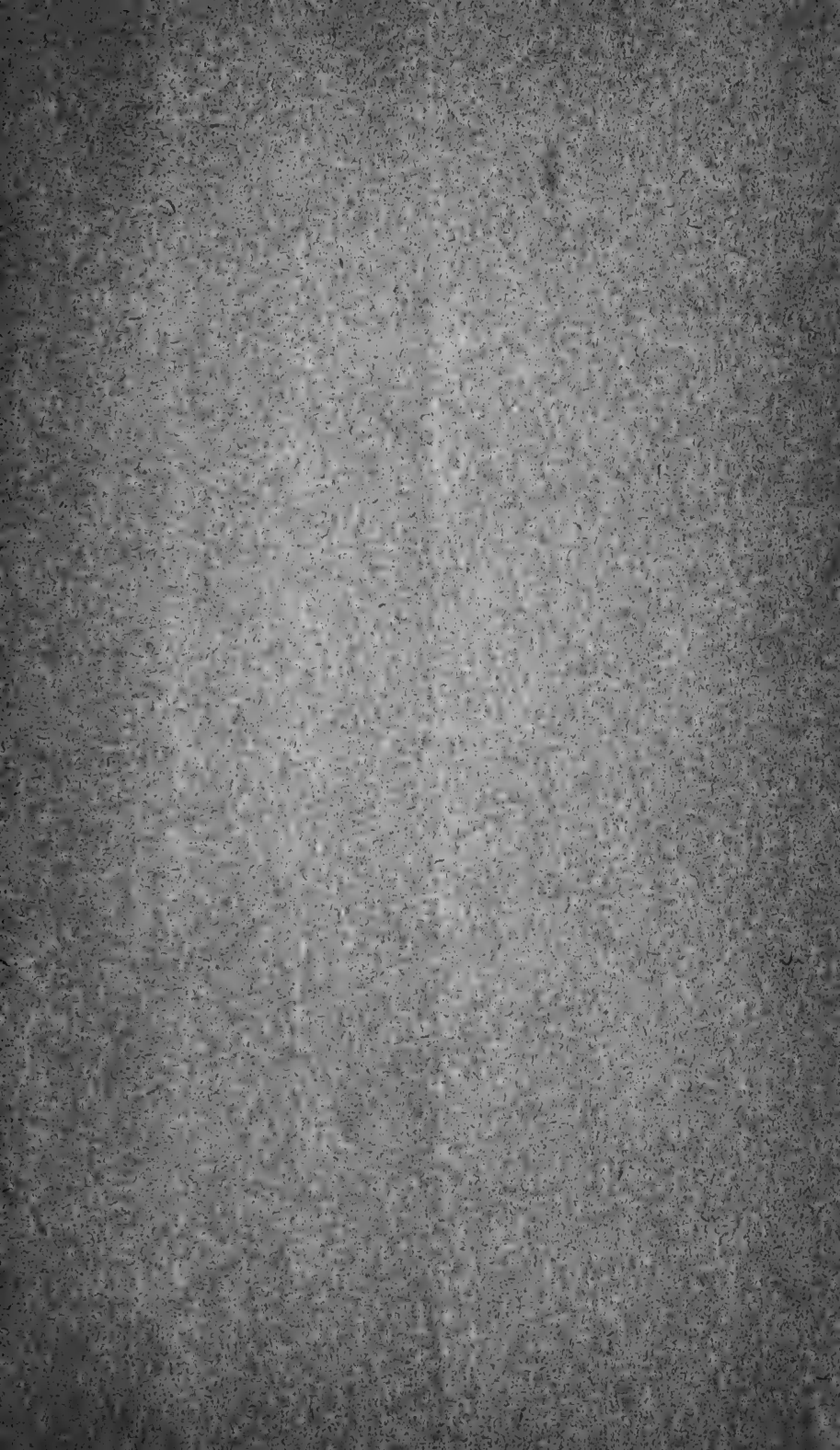
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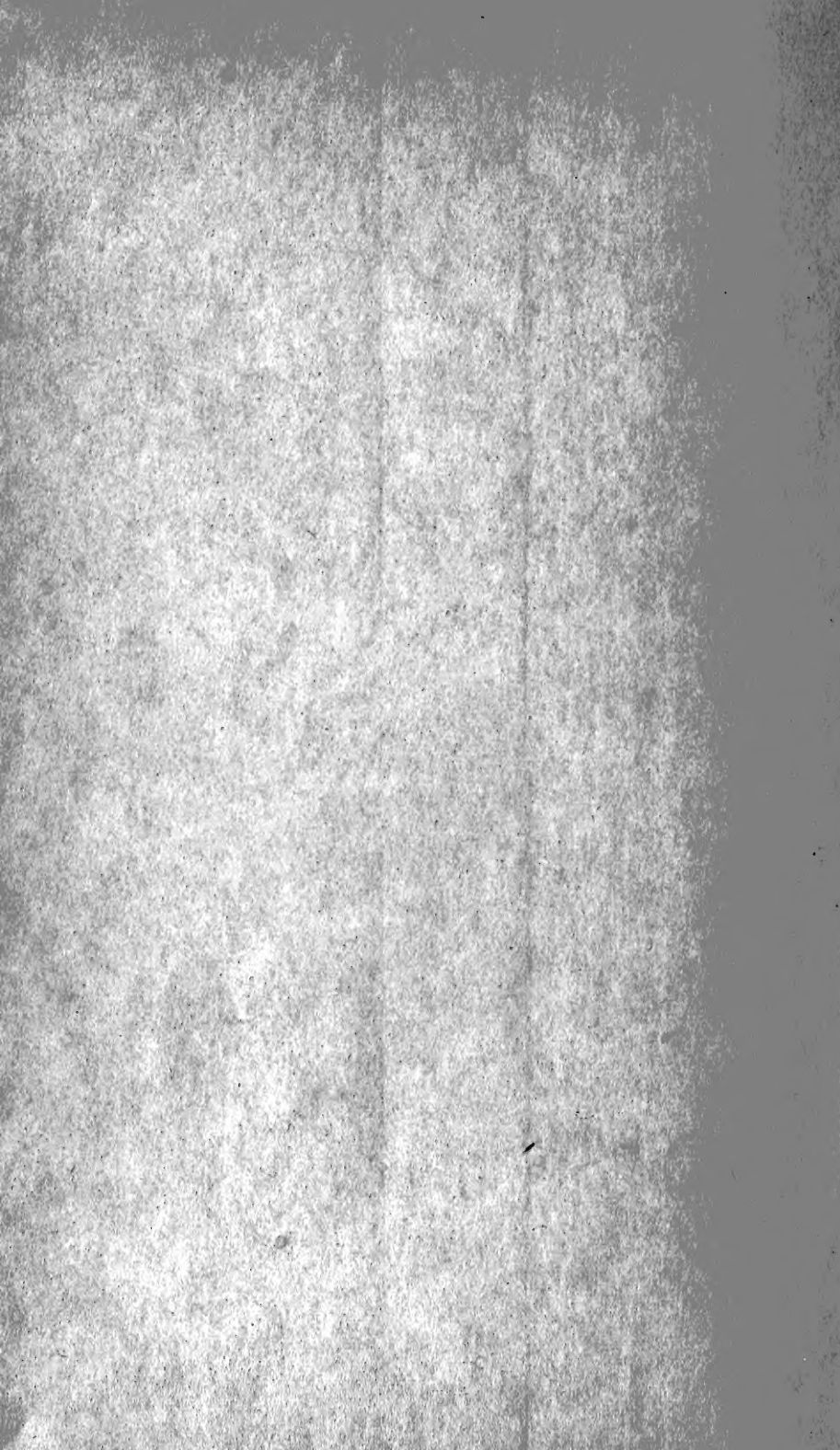
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