





MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY



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January, 1923

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JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY

The purpose of the Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora, and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographic distribution of the native plants will be especially welcome.

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REVISION OF THE CALIFORNIAN SPECIES OF ARCTOSTAPHYLOS

WILLIS LINN JEPSON

(concluded from page 86)

Var. *VIRGATA* Jepson n. comb. (*A. virgata* Eastw.), a shrub with somewhat willow-like leaves growing in Marin Co. (Rock Spr., Jepson 6804; Bill Williams trail, Jepson 9513).

Refs.—ARCTOSTAPHYLOS *GLANDULOSA* Eastw. Proc. Cal. Acad. ser. 3, 1:82 (1897), type loc. Mt. Tamalpais, *Eastwood*. Var. *VESTITA* Jepson. *A. vestita* Eastw. in Sarg. Trees and Shrubs, 1:205, pl. 97 (1905) type loc. Monterey, *T. Brandegee, Eastwood*. Var. *CRASSIFOLIA* Jepson. Var. *VIRGATA* Jepson. *A. virgata* Eastw. l. c. 1:203. pl. 96 (1905), type loc. Bootjack Trail, Mt. Tamalpais, *Eastwood*.

A. NISSEANA Merriam, Proc. Biol. Soc. Wash. 31:102 (1918), type loc. 2 or 3 mi. n. of Louisville, El Dorado Co., *Merriam*. Leaves 10 to 12 lines long; branchlets, peduncles and bracts hispid; flowers and fruit unknown (ex char.).

18. *A. TOMENTOSA* Lindl. This species was first published by Pursh as *Arbutus tomentosa* and founded upon a specimen by Menzies from the "Northwest Coast." Hooker and Arnott in the Botany of the Beechey, 144, comment upon the various forms which they include under *Arbutus tomentosa* Pursh, and cite the original plant as collected by Menzies on the Columbia River.¹ This specimen is in the Herbarium of the British Museum and is labeled "Mr. Menzies and Dav. Nelson." Pursh, however, quotes only Menzies. The type specimen is finely pubescent or even whitish woolly on the under surface of the leaves which are broadly oblong, bluntish, 1 to 1½ in. long, 7 to 10 lines broad; petioles short, 1 to 3 lines long. In addition to the fine pubescence the stems and petioles are furnished with hispid hairs, although not quite as pronounced as in Lindley's figure (Bot. Reg. t. 1791) which rests on a plant grown in England from seed presumably collected by Douglas.

The herbarium specimen of Douglas (British Museum) is somewhat more hairy than the Menzies specimen, with the leaves longer and more pointed. The stems are tomentulose and very hispid; the leaves are entire, acute or rounded at base, very shortly acute at apex, on petioles 2½ lines long. The bracts are foliaceous, linear (or slightly obspatulate), 5 lines long.

A. tomentosa as it occurs in California is a medium-sized erect shrub. It has always been my opinion, gradually confirmed, that it kills outright under fire and does not crown-sprout. This opinion

¹The Menzies type is said by Piper to have been collected at Monterey. The *A. tomentosa* of authors he names *A. columbiana* Piper. However this may be the latter certainly does not range "throughout much of California" as he states (Fl. Nw. Coast 279).

was verified once more last summer. While on a botanical expedition with my former student, Mr. J. P. Tracy, we turned off the coast road at the south end of Big Lagoon on the Humboldt coast. At that point the woods on the upper slopes thin down to the edge of a "fern prairie" and are succeeded by a border of brush, which contains *Arctostaphylos tomentosa*. A fire had burned a strip through this brush area, perhaps five years before, and a few individuals of *A. tomentosa*, that had been killed by the fire, were still standing. One dead shrub was particularly striking, as showing the lethal effect of intense heat on this species. Its hue and aspect were quite different from the fire-killed bodies of *A. sensitiva* on Mt. Tamalpais.

It is clear that *A. tomentosa* cannot be made to include such species as *A. canescens* Eastw. and *A. glandulosa* Eastw. which occupy so different a place in the chaparral society and show such different reactions to fire. *A. tomentosa* with its single trunk is in a different category from *A. canescens* and *A. glandulosa*, each of which exhibit a cluster of low rigid stems arising from a depressed or flattened woody base.

Locs.—North Coast Ranges: Inverness, *Jepson* 502a; Fort Bragg, *W. C. Mathews*; Kenny's, nw. Mendocino Co., *Jepson* 2155; Redwood Creek, Humboldt Co., *Jepson* 1953; Big Lagoon, *Jepson*. The following plants from the South Coast Ranges are included here with some reserve: San Luis Obispo, *J. E. Roadhouse*; Los Gatos, *Bioletti*; Santa Cruz Mts., *Jepson*; Saratoga, *Jepson* 5633; Kings Mt., San Mateo Co., *C. F. Baker* 327.

Refs.—ARCTOSTAPHYLOS TOMENTOSA Lindl. Bot. Reg. t. 1791 (1836). *Arbutus tomentosa* Pursh, Fl. 1:282 (1814), type from the Northwest Coast, Menzies.

19. *A. ANDERSONII* Gray is remarkable for its cordate or even auriculate leaves which are commonly sessile. It favors the summits of ridges, mostly in the central coast region. In relationship it is very close to *A. tomentosa* and it has been debated in my mind if it were not better to dispose it as a variety of that species, but at present it is retained as a valid species. It kills completely under chaparral fire. In the Oakland Hills it flowers in February, usually one month earlier than *A. glandulosa* Eastw., with which it is associated.

Locs.—Antioch, *K. Brandegee*; Mt. Diablo, *C. F. Baker* 3161; Oakland Hills, *Jepson* 5715, 6229; Pilarcitos Lake, San Mateo Co., *C. T. Blake*; Kings Mt., San Mateo Co., *C. F. Baker* 271; Sur River, *Davy* 7408; trail betw. Lucia and San Antonio River, *Hall* 9998; San Luis Obispo Co., *Ida M. Blochman*.

Var. *AURICULATA* *Jepson* n. comb. (*A. auriculata* Eastw.). Pubescence as in the species but more canescent or glabrate; leaves cordate at base, subsessile—Mt. Diablo. It forms pure colonies a few yards square and does not crown-sprout. Good examples of it occur in the rocky cañon at the head of Sycamore Creek, *Jepson* 9662, 9737.

Var. PECHOENSIS Jepson n. comb. Branchlets and leaves finely or sparsely tomentose; pedicels nearly or quite glabrous (ex char.).—Pecho Mts., San Luis Obispo Co.

Refs.—ARCTOSTAPHYLOS ANDERSONII Gray, Proc. Am. Acad. 11:83 (1876), type loc. Ben Lomond near Santa Cruz, *Anderson*; Jepson, Fl. W. Mid. Cal. 371 (1901). Var. AURICULATA Jepson. *A. auriculata* Eastw. Bull. Torr. Club 32:202 (1905), type loc. trail above the Boyd Ranch, Mt. Diablo, *Eastwood*. Var. PECHOENSIS Jepson. *A. pechoensis* Dudley; Abrams, N. Am. Fl. 29:98 (1914), type loc. head of Wild Cherry Cañon, San Luis Obispo Co., *Dudley*.

20. *A. INSULARIS* Greene is one of the peculiar insular species of the Santa Barbara group. It has been little studied in the field.

Ref.—ARCTOSTAPHYLOS INSULARIS Greene; Parry, Bull. Cal. Acad. 2:494 (1887), type loc. Santa Cruz Isl., *Greene*.

21. *A. PARRYANA* Lemmon. In the original description Lemmon makes the statement that this new shrub was discovered four miles west of Keene sta., Tehachapi Range. Four miles west of Keene sta. brings one to the slopes and summit of Bear Mt. which I have searched without finding any *Arctostaphylos* at all. It is very easy, however, to lose one's orientation in the Tehachapis and Lemmon may have been in error. Since he doubtless followed the wagon road his station probably is southerly from Keene, or Woodford as it is known in the postal guide. I have examined the type specimens in the Lemmon Herbarium and I regard the species as valid.

Refs.—ARCTOSTAPHYLOS PARRYANA Lemmon in Greene, Pitt. 2:68 (1889), type loc. Tehachapi Mts. near Keene sta., *Lemmon*, June 23 and Aug. 5, 1888.

22. *A. DRUPACEA* McBr. is a well-marked species of Southern California, essentially confined to the cismontane region.

Locs.—Seven Oaks, San Bernardino Mts., *Parish* 3709; San Bernardino Valley, *Jepson* 5588; Strawberry Valley, Mt. San Jacinto, *Jepson* 1305; Hot Springs Mt., *Jepson* 8744; Julian, *T. Brandegee*.

Refs.—ARCTOSTAPHYLOS DRUPACEA McBr. Contrib. Gray Herb. 53:16 (1918). *A. pringlei* Parry, var. *drupacea* Parry, Bull. Cal. Acad. 2:495 (1887), type loc. mts. e. of San Diego, *Orcutt* 543.

23. *A. BICOLOR* Gray is a highly distinctive species which has no near allies in California.

Locs.—San Diego, *Jepson* 6670; Encinitas, *K. Brandegee*; Fallbrook, *Parish*; Foster, *Hall* 3881; San Pasqual grade, *Jepson* 8506; Witch Creek, *Alderson*; Santa Catalina Isl., *Blanche Trask*.

Refs.—ARCTOSTAPHYLOS BICOLOR Gray, Proc. Am. Acad. 7:366 (1868), type loc. San Diego, *Cooper*. *Xylococcus bicolor* Nutt. Trans. Am. Phil. Soc. ser. 2, 8:259 (1843), type coll. by Nuttall, obviously San Diego, not "Monterey." *A. clevelandi* Gray, Syn. Fl. N. Am. 2:29 (1878).

ARCTOSTAPHYLOS Adans. MANZANITA.

Evergreen shrubs with very crooked branches, the bark dark red or chocolate-colored, smooth and polished. Leaves entire (rarely serrate), more or less vertical by twisting of the petiole. Flowers white or pink, in a terminal usually subglobose nodding cluster or panicle composed of few to several short racemes. Flower parts usually in 5s. Bracts commonly scaly. Sepals distinct. Corolla urn-shaped. Stamens twice as many as the corolla lobes; anthers with a pair of reflexed awns on the back; filaments more or less hairy, dilated toward the base. Ovary seated on a hypogynous disk, 4 to 10-celled, with one ovule in each cell, maturing into a dry brown berry-like fruit with an outer pulp covering several stony 1-seeded nutlets. Surface of the berry smooth, the pulp at first fleshy, at maturity usually mealy or powdery. Nutlets distinct, or irregularly united in 2s or 3s, or sometimes consolidated into a single stone.—Wood hard but brash, warping and cracking excessively in seasoning. (Greek arktos, a bear, and staphule, a grape; bears feed on the berries.)

A.—Leaves plane or nearly so, often more or less vertical.

1. Ovary glabrous (except in no. 3); leaves and branchlets glabrous or essentially so.

Erect robust shrubs 4 to 8 (or 14) ft. high.

Pedicels glandular; foliage very white-glaucous.

Berry with solid stone; pedicels viscid-glandular, sometimes glandular-pubescent; S. Cal.

and South Coast Ranges. 1. *A. glauca*.

Berry with separate nutlets; pedicels glandular-hairy; branchlets and peduncles very glaucous; Sierra Nevada foothills chiefly.

Ovary glabrous; branchlets and peduncles very glabrous 2. *A. viscida*.

Ovary glandular hairy; branchlets and peduncles glandular-hairy. 3. *A. mariposa*.

Pedicels not glandular or only obscurely or minutely so; berry not glandular (except in *A. elegans*).

Panicles very dense; peduncles and rachises minutely glandular, not pubescent; leaves

dark green; higher forest belt, chiefly Sierra Nevada. 4. *A. patula*.

Panicles more open; peduncles and rachises not glandular.

Branches disposed to be erect and straightish; peduncles and rachises glabrous or nearly so; leaves bright green.

Berry not glandular; Napa Range n. to Lake and Mendocino Cos. 5. *A. stanfordiana*.

Berry all over glandular; Lake Co. 6. *A. elegans*.

Branches crooked, spreading widely.

Leaves abruptly acute, mucronate, less than 1 in. long; mountains of S. Cal. 7. *A. pungens*.

Leaves obtuse or acute, more than 1 in. long; mountains of central and northern

Cal.

Peduncles and rachises canescently puberulent; panicles drooping; leaves light green; North Coast Ranges and northern Sierra Nevada foothills. 8. *A. manzanita*.

Peduncles and rachises glabrous or minutely puberulent; panicles erect or

only half-drooping; leaves pale or whitish; Sierra Nevada. 9. *A. pastillosa*.

Dwarf or procumbent or low shrubs; pedicels glabrous or nearly so.

High Sierra species; plants forming a rough mat. 10. *A. nevadensis*.

Coastal or seashore species.

Leaves ovate or obovate, shortly acute at apex, both sides alike. 11. *A. hookeri*.

Leaves mostly obovate, rounded or obtuse at apex.

Leaves both sides alike; berry mostly pink or red. 12. *A. uva-ursi*.

Leaves green above, paler beneath; berry brown. 13. *A. pumila*.

2. Ovary pubescent; leaves and branchlets pubescent or usually so.

Bracts brown or herbaceous; mostly Coast Ranges, and near the coast.

Nutlets distinct or united into sets of 2 or 3.

Calyx with entire sepals.

Leaves mostly 4 to 7 lines long; berry glabrous; nutlets thin-shelled.

Apex of leaves obtuse or bluntish; Mendocino coast and Amador Co. 14. *A. nummularia*.

- Apex of leaves abruptly short-acute, curved or deflexed; central coast region
- Leaves mostly 1 to 1½ (or 2) in. long; nutlets thick-shelled; berry minutely short-hairy. 15. *A. sensitiva*.
- Leaves rarely cordate, short-petioled.
- Branchlets not hispid; ovary densely white hairy, not glandular 16. *A. canescens*.
- Branchlets or some of them more or less hispid; ovary white hairy.
- Ovary hairs glandular; berry glandular 17. *A. glandulosa*.
- Ovary hairs not glandular; berry not glandular. 18. *A. tomentosa*.
- Leaves mostly cordate, thickly clothing the branchlets, sessile 19. *A. andersonii*.
- Calyx with fimbriate edge to sepals; Santa Barbara Is. 20. *A. insularis*.
- Nutlets united into a solid stone; Tehachapi Mts. to the San Gabriel Mts. 21. *A. parryana*.
- Bracts pink, petal-like; stone solid; S. Cal. 22. *A. drupacea*.

B.—Leaves strongly revolute, not at all vertical.

- Stone solid; S. Cal. coast 23. *A. bicolor*.

1. **A. gláuca** Lindl. GREAT-BERRIED MANZANITA. Shrub 6 to 8 ft. high, or almost arborescent and 15 ft. high with a trunk 6 to 13 in. in diameter; leaves glaucous and glabrous, roundish or elliptical to broadly ovate, obtuse or acute at apex, obtuse, truncate or subcordate at base, 1¼ to 1¾ in. long; petioles 3 to 7 lines long; panicle broader than high, frequently very compact; rachis glabrous, sometimes a little glaucous; pedicels glandular; flowers white, rather large; berry rather densely covered with minute glands and very viscid, globose. 5 to 8 lines broad; pulp scanty; stone solid, smooth.—Cismontane S. Cal., ranging n. to Monterey Co. and Mt. Diablo. Var. *EREMICOLA* Jepson. Leaves purple-veined; berry elliptic in outline.—Piñon Well Mts., n. Colorado Desert.

2. **A. víscida** Parry. WHITE-LEAF MANZANITA. Shrub 4 to 10 ft. high, with very striking contrast between the white foliage and deep red crooked branches; branchlets and peduncles glaucous and very glabrous, usually reddish, the rachis of the raceme or panicle glandular; leaves very white-glaucous, glabrous, elliptic, varying to orbicular or round-ovate, obtuse or abruptly acute, rounded at base, ¾ or 1 to 1½ (or 2) in. long; flowers in simple or forked racemes; pedicels 4 to 6 lines long, with short spreading glandular hairs; bracts small, ovate-lanceolate, acuminate; calyx-lobes reflexed over summit of pedicels; corolla light pink; berry deep red, globose, 3 to 4 lines broad, the surface very glandular, cohering in sticky masses when gathered, or often non-glandular; nutlets distinct or 2 or 3 united.—Foothills of the Sierra Nevada (often the only manzanita in the upper portion of the chaparral belt): Tulare Co.; Calaveras Co. to Butte Co.; and extending around the head of the Sacramento Valley into the inner North Coast Ranges and s. to the Napa Range. Remarkable for its white-glaucous branchlets and peduncles.

3. **A. maripòsa** Dudley. Shrub 4 to 8 ft. high with spreading branches and very white-glaucous foliage; branchlets and inflorescence glandular-pubescent or puberulent, the hairs mostly spreading; leaves glabrous or nearly so, very rigid, oval to elliptic, shortly acute or at least mucronulate, 1 to 1¾ in. long; panicle many-flowered, small, compact; pedicels with glandular hairs; ovary glandular-hairy; berry bright red, glandular-viscid, sometimes covered with minute stipitate glands.—Sierra Nevada, higher foothill region from Tuolumne Co. s. to Fresno Co. Very closely allied to *A. viscida* and sometimes difficult to distinguish from it. Var. *BIVISUM* Jepson. Leaves dark green, 1½ to 2½ in. long; branchlets glandular-hairy and somewhat dusky; berry whitish or somewhat lucent.—Hetch-Hetchy to Wawona.

4. **A. pátula** Greene. GREEN MANZANITA. Widely or diffusely branching, 3 to 5 (or 8) ft. high; peduncles and rachis of inflorescence, and commonly the branchlets, minutely glandular-puberulent; leaves bright green, glabrous, typically orbicular or broadly elliptic, mostly rounded at apex, or obscurely acutish, rounded or subcordate at base, 1 to 1½ (or 2¼) in. long; panicle corymbose, very

dense; bracts ovate, abruptly attenuate; pedicels glabrous, 2 to 3 lines long; sepal tips white-scarious; corolla deep pink; berry commonly dark or black when half-grown, when mature globose or commonly depressed, glabrous, often very hard, 4 to 5 lines broad; nutlets smooth on sides and back, not channeled.—Open pine woods, 4500 to 9000 ft. or 2500 to 5000 ft. at the north: Sierra Nevada from Shasta Co. to Tulare Co.; high North Coast Ranges from the Siskiyou Mts. and Mt. Shasta s. to Mt. Hull; San Gabriel, San Bernardino and San Jacinto mountains, W. Nev.; Ore. The dominant and usually the only species in its area in the Sierra Nevada. The panicle is commonly broad and flattish and its glandular-puberulent rachis is often dark, while the bracts are commonly ovate-attenuate. The berries when three-fourths grown are sometimes rather hard with the nutlets and pulp as if concreted.

5. *A. stanfordiana* Parry. Erect shrub 3 to 6 ft. high with slender dark red stems; leaves glabrous, bright green on both faces, narrowly ovate to oblanceolate, most frequently acute at both ends, 1 to 1½ in. long, very erect; branchlets, peduncles and rachis glabrous or obscurely or minutely glandular-puberulent; flowers light pink to lilac; corolla 2 to 3 lines long, very frequently with an obscure constriction just below the middle; berry very small, usually much depressed and commonly unsymmetrical or irregular, or sometimes globose, glabrous, usually a bright apple-red when first mature, about 1½ lines high and twice as broad; nutlets broader than high.—Mountain summits and ridges, Mendocino and Lake Cos., s. to the Napa Range and Mt. Diablo. Apr.-June.

6. *A. elegans* Jepson. Similar to *A. stanfordiana*; inflorescence nearly glabrous; flowers unknown; berry all over minutely stipitate-glandular.—Mt. Konocti, Lake Co.

7. *A. púngens* H. B. K. Shrub (2 or) 3 to 8 ft. high; branchlets canescent or



1. *Arctostaphylos manzanita* Parry.
Fl. branchlet, x 1.

white tomentulose; leaves oblong to elliptic, abruptly or somewhat obscurely short-acute, mucronate, finely pubescent or minutely tomentulose, eventually glabrate or often rather glossy, 8 to 10 lines (rarely to 1¼ in.) long; pedicels glabrous; panicles small; berries usually somewhat depressed-globose and 3 to 4 lines broad, but variable in size and sometimes eccentric in shape, glabrous, dark-brown or terra-cotta, shining.—San Bernardino and San Jacinto mountains, 5000 to 6000 ft., n. in the inner Coast Ranges to San Benito Co., thence to Marin Co., about 1600 to 2200 feet. E. to Ariz., s. to Mex.

8. *A. manzanita* Parry. PARRY MANZANITA.
(Figure 1.) Shrub 6 to 12

ft. high, commonly very erect, sometimes widely branched from the base with long straggling crooked branches, sometimes becoming almost elephantine in its proportions and up to 22 ft. high; branchlets, peduncles, and rachis finely and somewhat canescently puberulent; pedicels glabrous; leaves pale green, thick, glabrous or minutely puberulent, elliptic or oblong, acute or subacute at apex, acute or obtuse at base, 1 to 1½ in. long; panicles drooping; flowers white, some-

times pink tinged; bracts triangular-acute, small and dry; berry dull white in early summer, becoming deep reddish brown in late summer and autumn, smooth and glabrous, 4 to 5 lines in diameter; nutlets irregularly coalescent or separate, keeled or ridged and roughened on back, and often with 2 small lateral ridges.—North Coast Ranges (only or mostly the middle and inner ranges), n. to Tehama Co., thence s. in the Sierra Nevada foothills to Tuolumne Co.; also on Mt. Diablo. Reaches its greatest development in the Napa Range and in central Mendocino Co. about Long Valley where it is dominant locally.

9. **A. pastillösa** Jepson. Shrub 3 to 6 ft. high; leaves and pedicels glabrous, the peduncles and rachises glabrous or minutely puberulent; foliage light-green; leaves elliptic-oblong, or -obovate, varying to oblong-lanceolate and somewhat willow-like, mostly acute, glabrous and glaucous, 1 to $1\frac{3}{4}$ or $2\frac{1}{2}$ in. long; pedicels glabrous; panicles loose, erect or only half-drooping; ovary depressed, roughened but glabrous; berry elevated-globose or globose, dull white or later light brown, 4 to 6 or 8 lines broad; nutlets 4 or 5, or sometimes coalescing into one channeled or ribbed stone, the stone forming tardily.—Sierra Nevada, higher foothills, 2500 to 4500 ft., chiefly in a belt between *A. viscida* and *A. patula*.

10. **A. nevadénsis** Gray. PINE-MAT MANZANITA. Plants gregarious and roughly carpeting the forest floor, the main stems creeping or trailing, rooting, the erect branches 3 to 6 or 9 in. high; leaves obovate or oblong-ob lanceolate, obtuse and mucronate, or abruptly acute, glabrous or minutely puberulent, reticulate with dark veins, 7 to 12 lines long; pedicels glabrous, 1 to 2 lines long; berry dark carmine, smooth, glabrous, 2 to 3 lines in diameter.—Open pine woods 7000 to 9000 ft.: Sierra Nevada from Tulare Co. to Shasta Co.; high North Coast Ranges from n. Lake Co. to Siskiyou Co.

11. **A. hoókeri** Don. Procumbent or low shrub $\frac{1}{2}$ to 2 ft. high; branchlets and peduncles puberulent or minutely canescent; leaves bright green, shining, thinish, glabrous or nearly so, ovate or elliptic, shortly acute, mucronate, 7 to 12 lines long; flower-clusters small; pedicels glabrous; corolla $1\frac{1}{2}$ lines long; berry globose or depressed, glabrous, 2 to $2\frac{1}{2}$ lines broad.—Forming small colonies on sand-dunes or in open woods near the coast: San Francisco; Pajaro Hills; Monterey; San Simeon. Mar.

12. **A. uva-úrsi** Spreng. RED BEAR-BERRY. SAND-BERRY. Stems several, trailing, prostrate or buried beneath the sand (all from a single main root), giving rise to erect branching stems 4 to 6 in. high; bark dark brown or somewhat reddish, becoming roughish; leaves oval or obovate, rounded at apex, rarely retuse or subacute, often reticulate-veiny, puberulent or nearly glabrous, especially in age, $\frac{1}{2}$ to 1 in. long; corolla ovoid, white or pinkish, $2\frac{1}{2}$ to 3 lines long; berry typically brilliant red or pink, smooth and glabrous, 3 to $4\frac{1}{2}$ lines in diameter; nutlets 1 or sometimes 3-nerved on the back, obscurely roughened or reticulate on the sides.—Sand-dunes along the ocean shore: Mendocino Co.; Humboldt Bay; n. to B. C. and Alas., thence round the earth in arctic and northern regions.

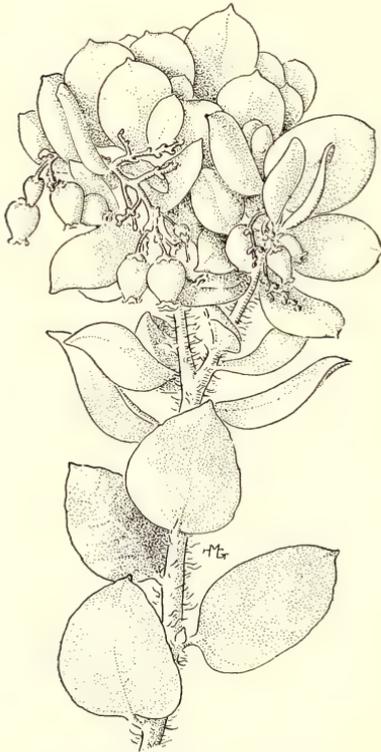
13. **A. pùmila** Nutt. Stems prostrate with ascending branches 4 to 8 in. high, forming somewhat coarse or rough mats 2 to 5 ft. broad; branchlets and leaves finely pubescent or downy, or the leaves above quite glabrate; leaves dull green, obovate, acutish, 5 to 9 lines long; pedicels nearly glabrous; corolla $1\frac{1}{2}$ lines long; ovary somewhat 5-lobed, seated in a saucer-shaped disk; berries reddish or red-brown, globose or globose-oblong, smooth, glabrous, 2 to 3 lines in diameter.—Sand hills and mesas e. of Monterey near the shores of Monterey Bay.

14. **A. nummulária** Gray. Dwarf bush $\frac{1}{2}$ to 1 ft. high, the stems ascending or diffuse; branchlets pilose-pubescent; leaves thickly clothing the branches, elliptic to ovate or oblong, glossy, veiny below, glabrous, or the margins ciliate, 4 to 7 (or 9) lines long, on petioles $\frac{1}{2}$ to 1 line long; corolla white, 1 to 2 lines long.—Mendocino coastal plain. Var. *MYRTIFOLIA* Jepson. Bark shreddy; leaves narrowly ovate, sometimes elliptic or oval, mostly obtuse at base, acute (or rarely

obtuse) and mucronate at apex, 3 to 6 (or 9) lines long; otherwise like the species.—Sierra Nevada foothills in Amador Co. Feb.

15. **A. sensitiva** Jepson. Slender erect shrub 2 to 5 ft. high; branchlets and petioles puberulent and bristly-hirsute; leaves roundish, abruptly acute or apiculate, finely reticulate-veiny beneath, nearly glabrous or sparingly bristly-ciliate, 5 to 7 (or 10) lines long, on petioles $\frac{1}{2}$ to 1 line long; flowers 2 lines long; ovary pubescent; berry oblong, 2 lines long.—Mt. Tamalpais; Santa Cruz Mts.; distribution restricted but locally abundant.

16. **A. canescens** Eastw. Shrub 3 to 6 ft. high; leaves ovate, rounded at apex or obscurely acute, $\frac{3}{4}$ to 3 in. long; branchlets, peduncles and leaves minutely and closely white-pubescent or canescent; pedicels more or less densely short-hairy and somewhat glandular, 2 to 4 lines long; bracts lanceolate, small, or sometimes large (3 to 6 lines long); ovary densely woolly; berry depressed-globose, 4 lines broad, faintly pubescent with very short spreading hairs.—Humboldt Co. s. to the Santa Cruz and Santa Lucia mountains, and far s. to the San Gabriel Mts. Commonly not in the immediate vicinity of the coast, nor reported thus far from the inner coast ranges.



2. *Arctostaphylos glandulosa* Eastw.
Fl. branchlet, x 1.

17. **A. glandulosa** Eastw. EASTWOOD MANZANITA. (Figure 2.) Medium-sized shrub 2 to 3 (or 7) ft. high with many stems arising from a widely spreading root-crown; branchlets, peduncles and pedicels with a dusky more or less glandular indument or tomentum, the branchlets bearing also scattered and usually short bristles which are more or less glandular; leaves ovate to elliptic or oblong, mostly acute, rounded or subcordate at base, dark or yellowish green and often somewhat glandular, most commonly glabrous or apparently so, or sometimes with a fine pubescence, 1 to $1\frac{1}{4}$ in. long; pedicels glandular-hairy, the hairs not dense, often scattered; flowers in rather small compact clusters, white or pinkish; bracts lanceolate, the lower foliaceous; anther awns red; ovary hairy with glandular hairs, usually densely so; berry globose or more commonly depressed, glabrate or under a lens usually showing very short very scattered white hairs.—On broken sandstone: San Diego Co. and San Gabriel Mts., n. to the Oakland Hills and Marin and Mendocino Cos. The most abundant species on the e. and s. slopes of Mt. Tamalpais. At other

stations commonly less or scarcely at all glandular. Var. **VESTITA** Jepson. Bark shreddy; leaves oblong-ovate, mostly acute, mostly truncatish at base, 1 to $1\frac{1}{2}$ in. long, green and glabrous above, with a fine tomentum or close felt-like pubescence beneath.—Santa Cruz Mts. to Monterey and the Santa Lucia Mts. Var. **CRASSIFOLIA** Jepson. Leaves elliptic, thick, 8 to 12 lines long.—San Diego coast. Var. **VIRGATA** Jepson. Leaves thin, somewhat willow-like, ovate to broadly lanceolate, mostly acute, serrulate or rough-edged, $1\frac{1}{2}$ to 2 in. long.—Mt. Tamalpais north to Tomales Bay.

18. *A. tomentosa* (Pursh) Lindl. HAIRY MANZANITA. Shrub 4 to 8 ft. high; branchlets very foliaceous; branchlets and petioles with two kinds of pubescence, long spreading bristly hairs arising from a fine tomentum, usually glandular; leaves sparingly pubescent or nearly glabrous, green or pale, ovate to narrowly or broadly oblong, acute, obtuse to subcordate at base, entire or rarely spinulose-serrulate, 1 to 2 in. long, typically on very short petioles; bracts linear-lanceolate, the lower or all foliaceous, $\frac{1}{4}$ to 1 in. long; pedicels glandular-puberulent; flowers white, in compact clusters; berry depressed, 3 to 4 lines in diameter; minutely and sparingly white-hairy under a lens; nutlets distinct or more or less united.—Immediate neighborhood of the coast from Marin Co. to Humboldt Co.; n. to Wash. Extending s. to the Santa Cruz Mts. and San Luis Obispo Co., though apparently not in typical form.

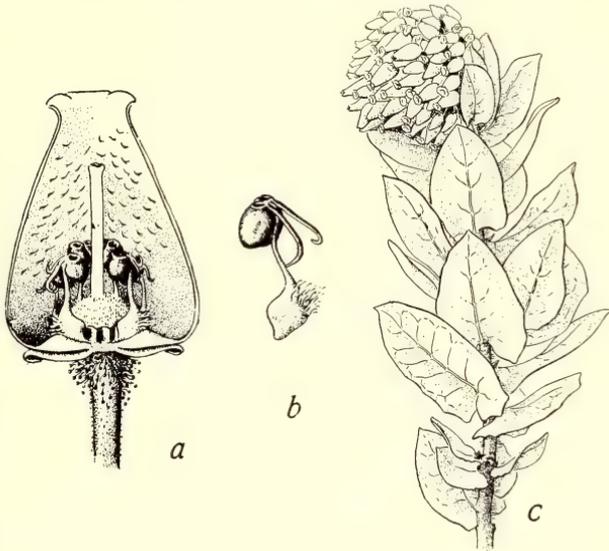
19. *A. andersonii* Gray. (Figure 3.) Four to 8 (or 14) ft. high; branchlets with copious straight spreading hairs or bristles and with glandular indument; leaves

crowded or almost imbricated on the branchlets, oblong or ovate, cordate at base or even auriculate, serrulate below the middle, puberulent or densely tomentulose, or becoming glabrous, 1 to $2\frac{1}{2}$ in. long, commonly sessile, or sometimes with a petiole 1 to 2 or 3 lines long; bracts mostly foliaceous, 2 to 6 lines long; pedicels glandular-puberulent; corolla 3 lines long, truncate at base; filaments glabrous; anther awns white; berry viscid-pubescent.—Antioch and Mt. Diablo to the Oakland Hills, Santa Cruz Mts. and Santa Lucia Mts. Var. *AURICULATA*

Jepson, Leaves usually conescent.—Mt. Diablo. Var. *PECHOENSIS* Jepson. Pedicels mostly glabrous.—San Luis Obispo Co.

20. *A. insularis* Greene. Shrub 4 to 7 ft. high; branchlets glandular-puberulent and with short spreading glandular bristles; leaves ovate, bright green, nearly glabrous, $\frac{1}{4}$ to 2 in. long; peduncles and rachises puberulent, the pedicels not puberulent but rather densely clothed with spreading glandular hairs; flowers in a large panicle of elongated racemes, leafy-bracteate at base; sepals with fimbriate margins; corolla white; berry yellowish-brown, nearly glabrous, 3 to 6 lines broad, 2 to 3 lines high.—Santa Cruz and Santa Rosa islands.

21. *A. parryana* Lemmon. Three to 5 ft. high; leaves ovate to elliptic, thickish, minutely purple-veined, and microscopically glandular, $\frac{3}{4}$ to $1\frac{1}{8}$ in. long; branchlets and rachis canescently puberulent; bractlets deltoid-acute, the upper half deciduous; flowers not seen; pedicels glabrous; berry glabrous or nearly so, the stone solid, obscurely about 6-ridged or -angled.—Tehachapi Mts. and s. to the San Gabriel Mts.



3. *Arctostaphylos andersonii* Gray.

a, long. sect. fl. x 4; *b*, stamen, x 6; *c*, fl. branchlet, x $\frac{1}{2}$.

22. **A. drupacea** McBr. Diffuse shrub 3 to 9 (or 15) ft. high; leaves elliptic, obtuse but abruptly mucronate, glaucous, minutely pubescent or subglabrous, $1\frac{1}{4}$ to $2\frac{1}{4}$ in. long; branchlets and inflorescence glandular short-pilose and pubescent; pedicels and bracts pink; pedicels 6 to 7 lines long; bracts membranous, lanceolate, 2 to 4 lines long, deciduous; sepals whitish, glandular-ciliate; berry red, oval, 3 lines long, the surface rugose and glandular short-hairy; stone solid.—Mts. and mesas of S. Cal. from the San Bernardino Mts. to the Cuyamaca Mts., 2000 to 7500 ft.; s. to L. Cal.

23. **A. bicolor** (Nutt.) Gray. Shrub 3 to 6 (or 10) ft. high; leaves coriaceous, brittle, oblong or elliptic, tapering to base and apex, tending to be revolute, dark green, shining and glabrous above, white-tomentose or felt-like beneath, 1 to $2\frac{1}{2}$ in. long; pedicels and calyx at first densely tomentose; calyx dark red; corolla rose-color, 4 lines long; ovary a little hairy at summit; berry reddish, eventually with smooth highly polished dark red or almost black surface, 3 to $3\frac{1}{2}$ lines broad; style-base persistent as a sort of short beak or papilla; stone solid, smooth.—W. San Diego Co.; Santa Cataline Isl.; L. Cal.

TWO BOTANISTS ON SIBIJAK VOLCANO¹

ALICE W. YATES

Brastagi, Sumatra,
Dutch East Indies,
May 10, 1922.

A few days ago Mr. Yates and I climbed the volcano "Sibijak." It is such an interesting trip from a botanical point of view that it occurred to me you might like to hear about it. The jungle always reminds me of the illustrations in Schimpfer. When I struggled through that book in your Forest Botany course in college, I never thought I should see those scenes myself.

The mountain is only 7500 feet high, while the surrounding country is 4500 feet. But it is a very hard climb, for a steep ridge must be crossed before reaching the mountain.

"Sibijak" is an active volcano and is quite the most wonderful sight I have ever seen. The top has been entirely blown off, leaving the jagged edge surrounding the crater. A huge crack extends almost to the base, containing many fumeroles giving off steam and sulphur; so that the rocks on either side of the crack are colored bright yellow. In the bottom of the crater is a sulphur lake. There are innumerable small fumeroles in the crater besides three large ones. One opening is about five feet across, the sulphur fumes roaring out of it with tremendous force. Another smaller opening gives off steam with a roar like that of a steam engine. The top of the mountain is covered with the crystallized sulphur, which makes a beautiful picture.

The variation in the vegetation from the foot of the mountain to the top is very noticeable. First, the trail leads through dense tropical jungle, with the trees close together and very high, covered with lianes, birds' nest ferns and mosses. We occasionally caught a glimpse of the monkeys swinging from one tree to another. We saw

¹Extracted from a letter. Dr. and Mrs. Yates have been for some years in the Philippines but are now stationed in Sumatra.—W. L. JEPSON.

here wild durians, figs, begonias, many rattans, Balanophora, Mussaenda, Hymenophyllum and other tropical friends.

Then the trees became lower and less dense and we saw *Quercus* species, *Ardisia*, *Freycinetia*, *Marantaceae*, to name only a few of the more noticeable ones. Higher up the vegetation became more and more stunted and we came to dense stands of pandan, *Ericaceae*, *Dianella*, *Vaccinium*, *Gualtheria*, *Histiopteris* and *Gleichneria*. There was no vegetation at the rim of the crater, but down in the crater we saw *Melastoma* and *Gahnia*.

We made this same trip last year when Mr. Yates collected some 110 species which he sent to the Bureau of Science in Manila for determination. He requested Mr. Merrill to send a set of the specimens to the University of California; so you will receive them eventually.

We are enjoying our holiday here in the hill country of Sumatra where it is delightfully cool. The climate is almost like that of Berkeley in the spring time. Brastagi is about 250 kilometers from Kisaran, where the United States Rubber Company have their large rubber plantation, and where we live. There is a colony of Americans and British people at Kisaran, about twenty. I believe there are not more than twenty Americans in all Sumatra. There is an American Consul in Medan and the ever present missionaries.

For diversions we have golf and tennis and the club at Kisaran. Mr. Yates enjoys the hunting very much,—elephants, tigers, crocodiles and wild pigs. A herd of about twenty elephants often comes within ten miles of our place.

We will be in the States just two years from now and hope to see you then. Mr. Yates joins me in sending best regards.

SIR JOSEPH HOOKER OAK (*QUERCUS LOBATA* NEE)

We spent one night under the spreading branches of the famous Joseph Hooker Oak near Chico. I took a few measurements. In order for the local enthusiast to boost the size of the tree, the girth is taken at 8 feet above the ground instead of the usual 4 feet. I find that at 4 feet above the ground the circumference is 22 feet 3 inches approximately. The tree is in exceedingly fine health and vigor, and shows a goodly supply of half grown acorns on many of its branches. I was particularly struck with the amount of young growth coming up under the tree. In a space exactly 10 feet square, i. e., 100 square feet, I counted 17 young oaks about 6 to 12 feet high. There is a large board placard swinging in the tree which reads:

SIR JOSEPH HOOKER OAK

Height of tree.....	101 feet.
Circumference of tree 8 feet from ground.....	28 feet 2 inches.
Spread of north and south branches.....	147 feet.

Circumference of outside branches.....	446 feet.
Lineal measure of south branch.....	105 feet.
Diameter of trunk 8 feet high.....	9 feet.
Estimated age of tree ¹	1000 years.
Number of persons, 2 square feet to each person, under shade.....	7885.

The tree has also received very careful surgery, and it is wired in all directions.

After rising the next morning, we collected a few things in flower; took a swim in the creek, and then drove up to Richardson's Springs, which is about 10 miles above Chico, in a narrow hot canyon. We picked up a few plants there, and then drove across the valley.—H. A. DUTTON, Aug. 12, 1921.

OPEN LETTERS

Quercus morehus in the San Bernardino Mts.

Under separate cover I am sending you specimen of oak leaves and acorn and ask you to please identify them for me. I found them near Camp Radford, San Bernardino Mts.—growing in a circle-shaped clump—about 50 trees in group, from 1 to 8 inches in diameter and about 25 feet high. The Black Oak, *Quercus Californica*, and Cañon Live Oak, *Quercus chrysolepis*, are growing all thru that section—and the only species there (except *Quercus dumosa*). Is this a hybrid of the two? It has characteristics of both. Is there such a hybrid recorded?—BERTHA ANTHONY, Oct. 30, 1921.

The material represents *Quercus morehus* Kell. This has been taken by some botanists as a hybrid, tho others do not so regard it. It is sometimes contended, and as frequently disputed, that hybrids are not found beyond the range of their parents. This tree, if it be a hybrid, is usually if not always fertile and is now known to be widely distributed in California.—W. L. J.

REVISION OF THE CALIFORNIA SPECIES OF THE GENUS DOWNINGIA TORR.

WILLIS LINN JEPSON

The opinion is sometimes expressed that the more recently described species of *Downingia* are too much alike. These small annuals do resemble each other in a general way very strikingly. They are all dwarfs and have essentially the same habit and vegetative characters. That for the most part they are definite specific units is shown, however, by the evidence here presented. I have had opportunity to study them carefully in the field and note results on the spot. It has been gratifying to discover additional facts

¹No individual of this species has been known to reach such an age. It is probably not over two or three centuries old and could easily have reached its present size in a century and a half.—W. L. J.

with each field examination. These characters have been organized in the following diagnoses which have been several times revised.

This task has been made the easier by the facility with which these plants may be brought from the field in the blooming state and assembled in the laboratory. They grow chiefly in the sun-cracked beds of former spring pools and, if cakes of mud are lifted with the plants, continue to live and flower readily under very indifferent care.

Downingia montana Greene is a proposal which seems to me insufficiently supported and I have reduced it to a variety of *D. bicornuta* Gray. *D. tricolor* Greene is not distinguishable from *D. concolor* Greene and I have made it a synonym of the latter species. *D. cuspidata* Greene I believe to be valid and have retained it as a good species. This is one of the least collected of the species and should be sought anew in Napa Valley.

KEY TO THE SPECIES

Corolla strongly 2-lipped.

Lower lip of corolla concave, the tube campanulate; stamen column long-exserted, the anther tube much incurved, nearly hook-shaped. 1. *D. elegans*.

Lower lip of corolla plane, forming a platform spreading at right angles to the tube which is more narrow; stamen column little or not at all exserted, the anther tube straight or only slightly curved.

Corolla tube shorter than the calyx lobes.

Sinuses of corolla not cut below platform; lobes of upper lip of corolla long, lanceolate and divergently spreading. 2. *D. pulchella*.

Sinuses of corolla cut below platform.

Lobes of upper lip of corolla coiled into a ring; main sinuses (between the lips) cut straight down; lower lip with yellow spots; calyx lobes ascending. 3. *D. ornaticissima*.

Lobes of upper lip of corolla not coiled; main sinuses (between the lips) cut far forward so that lower lip is hinged; calyx lobes rotate.

Lobes of upper lip parallel; angle of lower lip at throat with two nipples or folds; lower lip with a central quadrate maroon spot, but no yellow. 4. *D. concolor*.

Lobes of upper lip divergent, forming a V-shaped sinus; angle of lower lip at throat with 4 nipples or folds; lower lip with 2 yellow spots on a central white field. 5. *D. bicornuta*.

Corolla tube longer than the calyx lobes; no nipples or processes on angle of lower lip. 6. *D. cuspidata*.

Corolla obscurely 2-lipped, shorter than the calyx, its lobes subequal. 7. *D. humilis*.

1. ***D. elegans*** (Lindl.) Torr. Four to 7 (or 12) in. high; leaves oblong to oblong-lanceolate, 6 to 9 lines long; corolla light blue, veiny, the concave palate of lower lip with 2 greenish-yellow spots on a field of white; corolla tube very short-campanulate; upper lip cut $\frac{2}{3}$ of the way down, the segments ascending and somewhat divergent; lower lip 3-lobed at apex, the lobes parallel; side of throat next to lower lip frequently with purple spots and yellow lines; stamen column long-exserted, about equaling the upper segments, the anther column down-curved and bearing 2 recurved bristles on the lower side.—Sacramento and San Joaquin valleys; Mendocino Co. to Shasta Co.; Sierra Co. to Modoc Co., north to Washington.

Locs.—Egg Lake, *M. S. Baker*; upper Fall River Valley, *Jepson* 5747; Big Mdns., Plumas Co., *Platt*; Sierra Valley, *Jepson* 8037; Humboldt Co., *Chesnut & Drew*; Castle Peak, ne. Mendocino Co., *Jepson*; Willits, *Jepson* 1826, 2490 (lower corolla lip pale blue with double-pointed white spot in center; corolla showing disposition to turn pinkish in drying); Willows, *Jepson*; Vacaville, *Jepson*; Stockton, *Sanford*.

Refs.—*DOWINGIA ELEGANS* Torr.; Gray, Syn. Fl. 2:8 (1878); *Jepson*, Fl. W. Mid. Cal. ed. 2, 402 (1911). *Clintonia elegans* Dougl.; Lindl. Bot. Reg. t. 1241 (1829), type loc. Walla Walla, Columbia River, *Douglas*. *Bolehia elegans* Greene,

Pitt. 2:126 (1890); Jepson l. c. ed. 1, 480 (1901). *Downingia insignis* Greene, Pitt 2:80 (1890), type loc. Elmira, Greene. *Bolelia insignis* Greene, l. c. 126 (1890).

2. **D. pulchella**

Torr. (Figure 1.) Erect or ascending, 2 to 10 in. high; leaves oblong-ovate or narrower, $\frac{1}{2}$ in. long; calyx lobes rotate; corolla a deep bright blue; center of lower lip white with two obovate yellow spots contracting into narrow folds at the throat, either side of and in interval between the folds 3 dark violet spots; upper lip deeply 2-cleft, the long oblanccolate lobes very divergent and spreading; corolla tube 1 line long, lower lip ample (6 lines broad), plane and at right angles to the tube, its lobes quadratish, divergent or trefoil-shaped; stamen column nearly or quite equaling the upper lip; anther tube with 2 short bristles at apex.—South Coast Ranges; Sacramento Valley; northern Sierra Nevada (Sierra Co. northward). North to southern Oregon.

Locs.—Sierra Valley, *Jepson* 8038; Vacaville, *Jepson* 6775; Mt. Diablo, *Jepson*; Alvarado, *Jepson*; Milpitas, *R. J. Smith*; Gilroy, *Jepson*; Estrella, *Jared*; Lancaster acc. *I. M. Johnston*. Var. **ARCANA** JEPSON n. var. Lobes of upper lip spreading backward; anther tube not exerted.—Western San Diego Co. (La Mesa, *Jepson* 6678). Perhaps the same at Elsinore, Menifee and Perris.

Refs.—**DOWNINGIA PULCHELLA** Torr. Pac. R. Rep. 4:116 (1857); *Jepson*, Fl. W. Mid. Cal. ed. 2, 402 (1911). *Clintonia pulchella* Lindl. Bot. Reg. t. 1909 (1836), type from Cal., *Douglas*. *B. pulchella* Greene, Pitt. 2:126 (1890); *Jepson*, l. c. ed. 1, 481 (1901).

3. **D. ornatissima** Greene. (Figure 2.) Erect, slender, 2 to 6 in. high, simple or branched from the base; leaves linear or subfiliform; calyx lobes ascending; corolla very light or pale blue; lower lip with squarish white center bearing 2 yellow spots which contract into crests or folds at angle of the throat; lobes of the upper lip coiled backward into a ring, the sinus between them projected backward so as to appear like a short horn; somewhat similar horn-like folds or undulations occur laterally at base of sinuses between upper and lower lips; stamen column exerted a little from the tube, the anthers standing between the coils of the

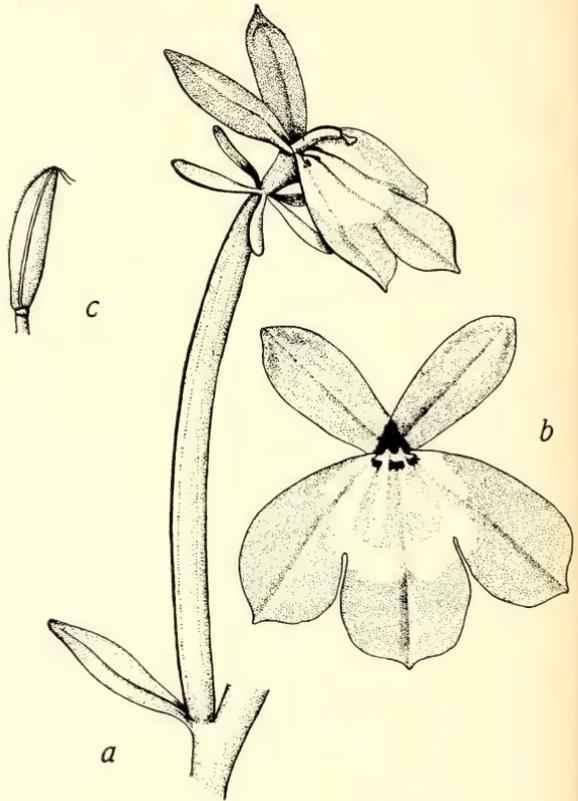


Fig. 1. *Downingia pulchella* Torr.
a, fl. x 3; b, fl., face view, x 3; c, anther column, x 9.

upper lip.—Low spots in the plains of the Sacramento Valley and lower San Joaquin Valley.

Locs.—Oroville, *Heller* 11,305; Viloet sta., Solano Co., *Jepson* 6798; Vacaville, *Jepson* 6774; Elmira, *Greene, Jepson*; Modesto, *Bessie B. Silverthorn*.

Refs.—DOWINGIA ORNATISSIMA *Greene, Pitt.* 2:80 (1890), type loc. Elmira, *Greene*; *Jepson, Fl. W. Mid. Cal. ed. 2, 403* (1911). *Bolelia ornatissima* *Greene, l. c.* 127 (1890); *Jepson, l. c. ed. 1, 481* (1901).

4. **D. concolor** *Greene.* (Figure 3.) Branched from the base and somewhat tufted or nearly simple, 1 to 2 (or 4) in. high, minutely puberulent; calyx lobes rotate; flower 4 to 4½ lines broad; corolla blue, the lower lip with a velvety purple quadrate spot on the white central field (or the white mostly absent), its lobes apiculate; nipples 2, arising on the angle of the lower lip from the purple spot and guarding the entrance to the throat; lobes of upper lip lanceolate, parallel, more or less ciliate, curving horizontally backwards; no processes at lateral sinuses; stamen column included; anther tube with 2 short bristles at apex.—Abundant locally in low spots, Santa

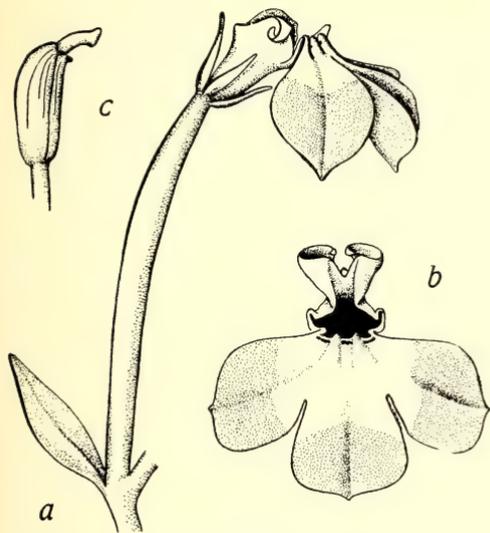


Fig. 2. *Downingia ornatissima* *Greene.*

a, fl., x 3; *b*, fl., face view, x 3;
c, anther column, x 9.

Clara Valley north to Lake Co. and the plains of the Sacramento Valley.

Locs.—Lakeport, *C. F. Baker* 3057; Sonoma Valley, *Jepson* 9189; Cañon sta., Solano Co., *Jepson* 6777; Denver-ton, *Jepson*; Suisun, *Greene*; Madroño, Santa Clara Valley, *Jepson*.

Refs.—DOWINGIA CONCOLOR *Greene, Bull. Cal. Acad. 2:153* (1886); type loc. Suisun, *Greene*; *Jepson, Fl. W. Mid. Cal. ed. 2, 402* (1911). *Bolelia concolor* *Greene, Pitt.* 2:127 (1890); *Jepson l. c. ed. 1, 481* (1901). *D. tricolor* *Greene, Pitt.* 2:79 (1890), type loc. Elmira, *Greene*; *D. concolor* var. *tricolor* *Jepson, l. c. ed. 2, 402* (1911). *Bolelia tricolor* *Greene, l. c.* 127 (1890). *B. concolor* var. *tricolor* *Jepson, l. c. ed. 1, 402* (1901).

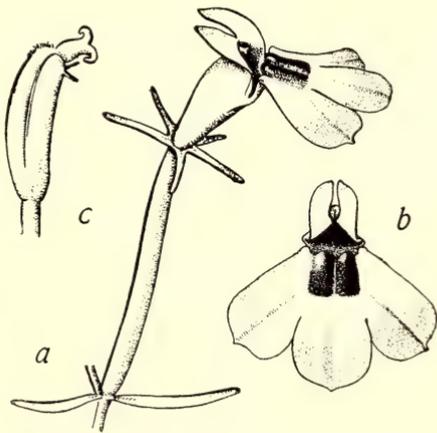


Fig. 3. *Downingia concolor* *Greene.*

a, fl., x 3; *b*, fl., face view, x 3;
c, anther column, x 9.

5, *D. bicornuta* Gray. (Figure 4.) Erect, 2 to 3 in. high; calyx lobes rotate; corolla blue, 5 lines broad; the lower lip with a white central field and two yellow spots; lower lip with 2 ascending horns or nipples at inner angle of the lip, the lateral margins folded back at the throat into 2 less prominent nipples, making 4 in all in a transverse line; lobes of upper lip deep violet purple, very short and broad, acute and curving backwards; sinuses between corolla lips running far forward, so that the lower lip appears hinged; stamen column not exerted from tube, bristle at apex of anther tube bent forward.—Low plains of the Sacramento Valley.

Locs.—Chico, *Greene*; Vacaville, *Jepson* 6776.

Var. *MONTANA* Jepson n. comb. Lobes of upper lip sub-parallel, longer than in the species; sinuses not so deeply cleft.—Montane: Sierra Nevada.

Locs.—Egg Lake, Modoc Co., *M. S. Baker*; Lake Eleanor, Tuolumne Co., *Chesnut & Drew*; Hetch Hetchy, *A. L. Grant* 852; Hog Ranch, Yosemite Park *Jepson* 3483; Carmel Mdws., se. Tulare Co., *Hall & Babcock* 5110.

Refs.—*DOWNINGIA BICORNUTA* Gray, Syn. Fl. ed. 2, 395 (1888), type loc.

Chico, *Bidwell*. *Bolelia bicornuta* Greene, Pitt. 2:127 (1890). Var. *MONTANA* Jepson. *D. montana* Greene, Pitt. 2:104 (1890), type loc. Lake Eleanor, Tuolumne Co., *Chesnut & Drew*. *Bolelia montana* Greene, l. c. 127 (1890).

6. *D. cuspidata* Greene. Stems very slender, 6 to 7 lines high; leaves mostly 1 to 2 lines long; flowers few; corolla violet, the lower lip with a basal yellow spot bordered by white; lower lip broadly trefoil-shaped, broader than long, plane or nearly so, without protuberances or folds or nipples at the angle; lobes broadly ovate, retuse or somewhat obcordate, cuspidately pointed; lobes of the upper lip $1\frac{1}{2}$ lines long, spatulate-obovate, cuspidately acute, slightly divergent; anther tube scarcely exerted from the comparatively long ($1\frac{1}{2}$ lines) and narrow corolla tube.—Valley fields, Napa and Sonoma Cos., May-June.

Loc.—Los Guilicos Valley, *Bioletti*.

Refs.—*DOWNINGIA CUSPIDATA* Greene, Erythea, 3:101 (1895), type loc. Yountville, Napa Valley, *Greene*; *Jepson*, Fl. W. Mid. Cal. ed. 2, 403 (1911).

Bolelia cuspidata Jepson (by error "Greene"), Fl. W. Mid. Cal. ed. 1, 481 (1901).

7. *D. humilis* Greene. Very dwarf, 1 to 2 in. high; calyx segments unequal, exceeding the corolla in length; corolla minute, white, 1 line long, obscurely 2-lipped, the ovate-oblong acute segments not very unlike.—Southern Sonoma Co.

Locs.—Sonoma Valley, *Jepson* 9194; Shellville, *Michener & Bioletti*.

Refs.—*DOWNINGIA HUMILIS* Greene, Leaflets 2:45 (1910); *Jepson*, Fl. W. Mid. Cal. ed. 2, 403 (1911). *Bolelia humilis* Greene, Pitt. 2:226 (1892), type loc. Sonoma plains, *Bioletti*; *Jepson*, l. c. ed. 1, 481 (1901).

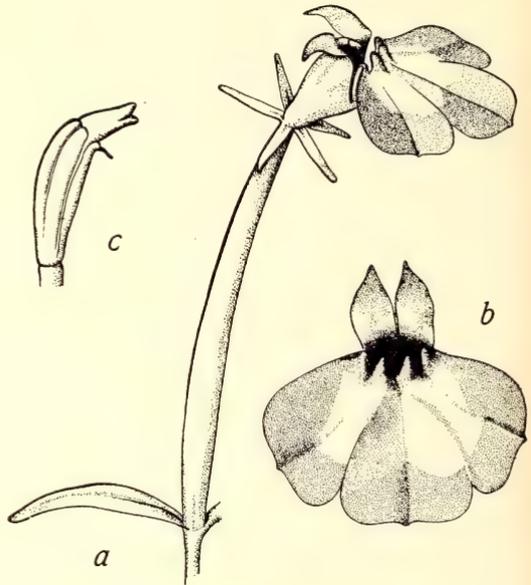


Fig. 4. *Downingia bicornuta* Gray.

a, fl., x 3; b, fl., face view, x 3; c, anther column, x 9.

Field Trips and Meetings

JANUARY-MAY, 1922



Sunday, Jan. 8. Redwood Peak for study of fungi. Meet at 13th and Broadway, Oakland at 9 a.m. Take Park Boulevard car. Leader, Mr. Harold Parks.

Sunday, Jan. 22. Fort Barry. Take 8:15 Sausalito boat from San Francisco ferry building. Walk from Sausalito. Leader, Miss Amy Rinehart.

Saturday, Jan. 28. Ninth annual dinner of the Society at Y.W.C.A. cottage, Allston Way and Union Streets, Berkeley, at 5:30 p.m. After dinner there will be an entertainment program in the living room of the "Y."

Sunday, Feb. 5. Tennessee Cove, Marin Co. Study of beach and salt marsh flora. Take 8:15 Sausalito boat and train from San Francisco ferry building to Manzanita. Walk to beach. Leader, Mrs. Adeline Frederick.

Sunday, Feb. 19. Lake Lagunitas. Take 8:15 Sausalito boat from San Francisco ferry building to Ross. Leaders, Mr. C. W. Carruth and Mr. W. S. Fields.

Sunday, March 5. Berkeley Hills. Study of native and introduced grasses. Meet at University entrance, Center and Oxford Streets, Berkeley, 9 a.m. Leader, Professor P. B. Kennedy.

Thursday, March 9. Regular meeting in 212 Wheeler Hall, University Campus, Berkeley, at 8 p.m. Lecture on "Utilization of Hybrids in Practical Gardening," by Professor Roy Claussen.

Sunday, March 19. Pilarcitos Lake. Study of trillium and mosses. Take 8:40 electric line from 5th and Market Streets, San Francisco. Ticket to Millbrae and return. Leader, Dr. E. F. Card.

Sunday, April 2. Arequipa Sanatorium and San Anselmo Creek. Objective, study of *Aristolochia*. Take 8:15 Sausalito boat from San Francisco ferry building to Manor. Leader, Mrs. Y. M. de Reygades.

Thursday, April 13. Annual meeting in 212 Wheeler Hall, University Campus, Berkeley, at 8 p.m. Election of officers. Dr. W. L. Jepson will give a lecture on the subject, "The Giant Redwoods of the North Coast."

Sunday, April 16. Lake Chabot. Meet at triangle, San Leandro, at 9 a.m. Walk up Estudillo Avenue to lake. Leader, Mr. Stephen Wyckoff.

Sunday, April 30. Niles Canyon by auto-bus. Meet at 13th and Broadway, Oakland; start at 8 a.m. Leader, Professor H. E. McMinn. In order to schedule the trip 30 must sign in advance. Remit \$1.50 to Mrs. Adeline Frederick, 1636 Woolsey Street, Berkeley.

Sunday, May 14. Major Vanderbilt's gardens for study of intensive and extensive culture of delphinium. Take 8:15 Sausalito boat from San Francisco ferry building to San Rafael. Leaders, Professor Babcock and Mr. J. L. Collins.

May 27 to 30. Annual camping trip. Members desiring to have the special circular send name to Mrs. Adeline Frederick, 1636 Woolsey Street, Berkeley, not later than May 1st.

Verify all train times on latest railway schedules.

Each member should be provided with lunch and cup on all field trips.

Schedule of Field Trips and Meetings

SEPTEMBER, 1922 TO JANUARY, 1923



- Sunday, Sept. 17.** Ingleside for study of beach flora. Meet at entrance of upper waiting room, San Francisco ferry building, 9:30 a. m. Leader, Miss Edna Finley.
- Sunday, Oct. 1.** Twin Peaks, San Francisco. Meet at upper waiting room entrance, San Francisco ferry building, 9:30 a. m. Leader, Dr. E. F. Card.
- Sunday, Oct. 15.** Fort Point. Leave Fort Mason, foot of Van Ness Ave. on U. S. S. Slocum, 9 a. m. From San Francisco ferry take Union St. cars. Leader Miss Amy Rinehart.
- Sunday, Oct 29.** Bay Farm Island for study of Halophytes. Meet at Lincoln Park station, Alameda, 1:30 p. m. Leader Miss Crocker.
- Thursday, Nov. 9.** 8 p. m. Regular meeting in 212 Wheeler Hall, University campus. Professor F. T. Bioletti will give a talk on "Botanical Reminiscences."
- Sunday, Nov. 12.** Hayward Cañon. Meet at 13th and Broadway, Oakland, at 8:30 a. m. Take Hayward car to end of line. Leader, Miss Alsop.
- Sunday, Nov. 26.** Rockridge, Oakland, for study of fungi. Meet at end of Rockridge car line, 9 a. m. Leader, Mr. Alfred Walker.
- Sunday, Dec. 10.** Tiburon and Belvedere. Take 1:45 p. m. Tiburon boat from San Francisco ferry. Leader, Dr. Ruth Allen. Those wishing to remain late will provide supper.
- Sunday, Jan. 7.** Redwood Peak, for study of fungi. Meet at 13th and Broadway, Oakland, 8:30 a. m. Leader, Mr. Harold Parks.

Members are privileged to invite guests to meetings and field trips.

Lunch and cups should be provided on all day trips.

Verify train and boat schedules by latest timetables.

MADROÑO

JOURNAL OF THE
CALIFORNIA BOTANICAL
SOCIETY



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March, 1923

MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY

The purpose of the Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora, and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographic distribution of the native plants will be especially welcome.

Back Numbers of the Journal may be had from the Assistant Secretary,

MRS. ADELINE FREDERICK,
1636 Woolsey St., Berkeley, Calif.

Manuscript for publication should be sent to

DR. W. L. JEPSON,
2712 Benvenue Ave., Berkeley, Calif.

Dues of members are \$2.00 per year.

MRS. LINDA G. DODD, *Treasurer*,
2636 Hillegass Ave., Berkeley, Calif.

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The Society desires botanical books for its library. Pacific Railway Survey, vol. 4, and volumes of the Botanical Gazette will be especially appreciated.



MADROÑO

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OPEN LETTERS

Quercus chrysolepis Liebm. in Bouquet Cañon

I am taking the liberty of sending you herewith a couple of photographs taken recently of what I believe to be the largest Cañon Live Oak in California. This tree is located on the side of a mountain about one mile above Bouquet Cañon in the Santa Barbara National Forest. It measures over ten feet in diameter, eighty-five feet in height and has a spread of over one hundred and twenty-five feet.

In spite of its enormous size the tree is in excellent condition but lost a large limb last winter due to the unusually heavy snow-fall. The enormous size of this tree is probably accounted for by the fact that a large spring comes out of the ground right under the roots of the tree.—L. A. BARRETT, Assistant District Forester, U. S. Forest Service, San Francisco, July 1, 1922.

Cercis occidentalis Torr. (Red Bud)

This magnificent shrub I found growing along Putah Creek on the road from Winters to the Napa Mountains. These shrubs were dense, 4 to 12 feet high—each standing alone, a solid mass of bloom, a wonderful blaze of glory among the green willows and low trees of the creek banks. We saw several with the trunks covered with Dutchman's Pipe in full bloom. I am unable to classify it and so beg your assistance.—ROSE LINEBAUGH, April 14, 1922.

Both for its unusual season of bloom and the great abundance of red flowers produced on its winter branches before the leaves appear, *Cercis occidentalis* is a remarkable species among the native shrubs and deserves a place in gardens. It is common in the Sierra foothills and recurs in certain areas in the inner Coast Ranges, but its distribution is not as yet well worked out. Mr. Anson Blake tells me that it does not occur in Berryessa Valley, nor westward to Howell Mountain, nor in Napa Valley. My own field records give confirmation to this. It comes in, however, about Middleton, Lake County, and Mr. Blake has noted it again on Cold Creek on the road to Potter Valley, Mendocino County. It approaches the coast less nearly than certain other interior or arid region species which range westward and may prove a good index plant for certain combinations of the climatic factors.—W. L. JEPSON.

Skunk Cabbage (*Lysichiton Kamtschaticensis*) on the Mendocino Coast

The pods sent you were collected on September 9, a short distance from Mendocino City. They were growing in water but not in a running stream. The stalks are of very frail substance so that the stem soon wilts, letting the pods fall into the water. There they immediately disintegrate—I suppose from the effects of the water but the townspeople tell me also from the wood-rats. The pulpy substance enclosing the seeds swells, making a gelatine-like mass

resembling tapioca. This, I presume, is for the purpose of getting the seeds transported by the water without injury as they did not appear ripe. (However I am not sure that I would know a ripe seed if I were to see one). The plants grow in swampy areas and in the beginnings of small streams, the leaves attaining a much greater size than any that I was able to send. I think it would be safe to say that some are nearly three feet long.—MARY G. CLARK, San Francisco, Oct. 1, 1921.

HOOKER OAK

WALTER A. BUCKBEE

When bold Balboa, eagle eyed,
 Stood on a peak in Darien,
 And gazed upon that rolling tide,
 Then I was old—old even then.

Wisdom the wind had whispered me,
 And taught me of the restless things—
 The bear with swaying head, the bee,
 The pigeon with the whistling wings.

The cats come creeping from the rocks,
 The lonely wolf to moon and mourn,
 And black-tailed deer with muddy hocks,
 To rub the velvet from the horn.

I hear a screaming in the dark;
 The crackling and the thrash of brush,
 And then a faint and far-off bark—
 And then again—the forest hush.

Black in the moon the shadows wave,
 I see them dancing two and two,
 And which was shadow, which was brave,
 Only I and the moon-man knew.

And now you come with giant plow
 To spoil my poppy fields of gold.
 When did you come and where and how?
 I nodded a bit for I am old.

Etching the East like lines on lead,
 Against the wind the wild geese climb,
 As over the marsh and valley spread,
 The cold grey fogs of winter time.

And now the big round sun appears;
 The ants creep up my trunk again.
 And so it was a thousand years
 Before that day in Darien.

A REVISION OF CALIFORNIAN UMBELLIFERAE

WILLIS LINN JEPSON

Field expeditions into all parts of California on the part of the author during a period of many years have brought together a large number of specimens and a large amount of field data concerning native Umbelliferae. This material has been gradually worked up and the results of comparison in the herbarium and the garden have been assembled and organized into the present paper. It is the object here, first, to set forth corrected but more especially new diagnoses of the genera and species, in order that the descriptions may more nearly approximate the status of the plant in the field. The reconstruction, from time to time, of species diagnoses, old as well as new, in order to bring them into harmony with known facts, while laborious and not showy, is nevertheless important, since, under such practice, the written diagnoses constantly approximate the plant in the field and thus tend to stabilize the species concept and render it clearer. In the second place, it is here attempted to define more clearly and precisely the geographic ranges, in the light of our present knowledge of the topography and climatology of the state. In the third place, selected specimens have been cited as representative of the diagnoses and in validation of the indicated ranges. In the fourth place, the more important bibliographic references for each species have been listed, and the references carefully checked as far as possible.

In addition to the great advantages of field expeditions, the writer has also had the privilege of examining the types of many early species at the Herbarium of the Royal Botanic Gardens at Kew, London, particularly those of Douglas, Nuttall and Hartweg, and also a few types at the Gray Herbarium of Harvard University.

From the standpoint of number of species, our three most important genera are *Eryngium*, *Sanicula* and *Lomatium*. *Eryngium* is represented by a very large number of forms which are difficult to segregate as specific units. Ecologically the most representative and wide-spread species is *E. vaseyi* C. & R. Its seeds germinate in the beds of winter pools and develop in early spring a tuft of quill-like or tubular leaves which are distinctly septated. As the waters are dried up by the rising temperatures of April and May, leafy shoots appear which bear broad dorsiventral leaves with variously cleft or toothed margin. Under the heat of the summer period these leaves, especially the lower ones, disappear, and the inflorescence develops and matures into fruiting condition by July or August. There are thus three fairly distinct stages, all of which are profoundly affected by variation in the ecological factors. The leaves vary much in size and outline, the plant varies in habit, and the bracts and bractlets vary in length and toothing. In consequence it is difficult to fix upon characters for reliable differentiae. This

species, *E. vaseyi*, presents a fair or average picture of the various species of the genus in California.

The genus *Sanicula* presents less difficulty, but its representatives show remarkable variation in leaf outline and segmentation and, to a certain degree, in habit. Marked plants in the open, or cultivated plants in the garden, give, however, satisfactory data regarding range of variation in the species of this genus.

Our largest genus, *Lomatium*, is only to a slight degree variable in habit and foliage. For differentiae one must depend in great measure upon the characters of the fruit and its oil-tubes. While the results of variation studies upon the oil-tubes have been incorporated in the diagnoses, it must, however, be noted that even with the best material this character is often unsatisfactory, and reliance upon the number and disposition of the oil-tube structures must be exercised with suitable caution and reserve.

The figures, forty in number, prepared as illustrations for this paper, are entirely original. They have been drawn by Joyce M. Saunders, in certain cases from preliminary studies by Elsie M. Zeile. The accenting of the generic and specific names is the work of Professor C. B. Bradley.

SYNOPSIS OF THE GENERA

A. Fruit bearing prickles, bristles, scales or tubercles.

- Ribs and oil-tubes none.
 Fruit covered with hyaline scales; flowers greenish white or blue; prickly perennial herbs 1. *ERYNGIUM*.
 Fruit bur-like, covered with hooked prickles.
 Flowers yellow or purple, mostly in head-like clusters; perennials 2. *SANICULA*.
 Flowers white, in compound umbels; annuals 3. *ANTHRISCUS*.
 Rib present; flowers white.
 Oil-tubes none or obscure.
 Fruit with an elongated beak several times longer than the muriculate body; annuals 4. *SCANDIX*.
 Fruit not beaked or with a short beak several times shorter than the smooth body; ribs bristly; perennials 5. *OSMORRHIZA*.
 Oil-tubes present, usually conspicuous.
 Ribs armed with bristles.
 Fruit somewhat flattened dorsally; umbel compound 6. *DAUCUS*.
 Fruit flattened laterally; bristles hooked.
 Umbels subcapitate, opposite the leaves; fruit prickly on one carpel, warty on the other 7. *TORILIS*.
 Umbels compound, terminal and lateral; fruit prickly on both carpels 8. *CAUCALIS*.
 Ribs not armed, inconspicuous; fruit tuberculate-roughened; umbels irregularly compound 9. *APIASTRUM*.

B. Fruit not prickly or tuberculate nor scaly (sometimes hairy).

1. *Leaves simple; umbels simple or proliferous.*
 Leaves alternate or in a basal tuft; carpels with filiform ribs; stems creeping; perennials.
 Oil-tubes none; leaves orbicular or peltate 10. *HYDROCOTYLE*.
 Oil-tubes solitary; leaves consisting of hollow cylindrical petioles 24. *LILAEOPSIS*.
 Leaves opposite; carpels without ribs; stems slender, weak; annuals 11. *BOWLESIA*.
 2. *Leaves pinnately or ternately compound or decomposed; umbels compound.*
 a. Ribs of the fruit not winged; fruit not flattened dorsally, sometimes somewhat laterally flattened.
 Flowers white, rarely pinkish, or at least not yellow.
 Oil-tubes none.
 Fruit linear or elongated ($\frac{1}{2}$ to 1 in. long); stems not dotted 5. *OSMORRHIZA*.
 Fruit ovate ($1\frac{1}{2}$ lines long); stem purple dotted 12. *CONIUM*.

Oil-tubes present.

Oil-tubes solitary in the intervals (see also no. 18).

Petals conspicuously unequal; lower leaves with broad leaflets, the upper dissected... 13. CORIANDRUM.

Petals equal or essentially so.

Umbels subsessile in the forks and terminal on the branches... 14. APIUM.

Umbels terminal on the branches.

Bracts 3-parted to the middle into filiform divisions, closely reflexed; upper leaves ternately decomposed and dissected... 15. AMMI.

Bracts entire or merely toothed, spreading or rarely reflexed; leaves pinnate or bipinnate.

Leaflets entire; ribs filiform; plants of dry ground or moist meadows... 16. CARUM.

Leaflets serrate; plants of marshes or stream banks.

Ribs corky but distinct.

Styles short (about $\frac{1}{2}$ or $\frac{1}{5}$ as long as the fruit); fruit broadly ovate or roundish... 18. CICUTA.

Styles long (about $\frac{1}{2}$ as long as the fruit); fruit subcylindric... 19. OENANTHE.

Ribs confluent, forming a continuous corky covering... 20. BERULA.

Oil-tubes 2 or more, at least in some of the intervals.

Ribs, or some of them, corky.

Leaves simply pinnate; stems leafy; ribs all corky; marsh or aquatic plants... 21. Sium.

Leaves once or twice ternate, all basal; lateral ribs corky-thickened, the others slender; slopes towards the arid interior... 22. OROGENIA.

Ribs not corky-thickened.

Pedicels of the flowers equal or nearly so; calyx-teeth not rigid.

Leaves once to thrice ternate or pinnate; mostly tall plants.

Leaflets linear, mostly entire; ribs filiform... 17. EULOPHUS.

Leaflets ovate, incised; ribs prominent, acute... 23. LIGUSTICUM.

Leaves pinnate or bipinnate, the divisions or leaflets oblong, entire; alpine dwarf... 25. PODISTERA.

Pedicels of the sterile flowers surpassing or equaling the fruit; sterile calyx-teeth rigid-subulate, very prominent... 26. OREONANA.

Flowers yellow.

Stems of medium height, the leaves mostly basal; leaflets broad... 27. VELAEA.

Stems very tall, leafy; leaves dissected into filiform segments... 28. FOENICULUM.

b. Some or all the ribs of the fruit winged.

Lateral ribs winged, the dorsal and intermediate ribs filiform; fruit flattened dorsally.

Oil-tubes reaching only half way to the base of the fruit; marginal flowers of umbel with radiately enlarged corollas; tall coarse plants... 29. HERACLEUM.

Oil-tubes as long as the fruit; corollas all alike.

Leaves and peduncles arising from the root-crown, or from only a very short proper stem.

Lateral wings of fruit corky-thickened; flowers commonly yellow; tall plants with large leaves... 30. LEPTOTAENIA.

Lateral wings thin; flowers yellow, white or purple; low plants with medium or small leaves... 31. MATIUM.

Stems tall, leafy.

Dorsal and intermediate ribs 3; flowers yellow.

Leaves pinnate, the leaflets ovate, toothed... 32. PASTINACA.

Leaves ternately compound and dissected into filiform segments... 33. ANETHUM.

Dorsal and intermediate ribs apparently 5; leaves simply pinnate; flowers white... 34. OXYPOLIS.

Lateral, dorsal and intermediate ribs winged or very prominent.

Tall plants with leafy stems; flowers white.

Umbellets not capitate.

Ribs not corky-thickened; fruit flattened dorsally; petioles not inflated.

Leaflets incised or deeply toothed; oil-tubes solitary in the intervals... 35. CONIOSELINUM.

Leaflets not incised, merely serrate or toothed or entire; oil-tubes 1 to 3 in the intervals... 36. ANGELICA.

Ribs very thick and corky; fruit slightly flattened laterally if at all; petioles inflated... 37. COELOPLEURUM.

Umbellets capitate; fruit cuneate-obovate, flattened dorsally, pubescent... 38. SPHENOSCIADIUM.

Mostly low plants, the leaves and peduncles all basal; oil-tubes several in the intervals; flowers white, yellow or purple; fruit flattened dorsally or not at all... 39. CYMPTERUS.

1. ERYNGIUM L. BUTTON SNAKEROOT

Perennials with clustered coarse fibrous roots, often dichotomously branching stems, prickly involucre and often prickly leaves. Leaves opposite, or the upper sometimes alternate, commonly oblanceolate and spinulose-serrate or incised, or the basal, when growing in water, with fistulous petioles and the blade more or

less obsolete. Flowers greenish white or bluish, condensed in heads; heads terminal on the branches or on short peduncles in the forks; bracts spinose, conspicuous; bractlets usually spinose-tipped. Calyx-lobes persistent on the fruit. Fruit covered with whitish thin scales; ribs obsolete. Oil-tubes none or obscure. (Greek name used by Dioscorides.)

Sepals entire.

- Heads very blue.....1. *E. articulatum*.
 Heads greenish, seldom blue.
 Blades of lower cauline leaves about $1\frac{1}{4}$ in. long, the petioles several times as long.....2. *E. alismaefolium*.
 Blades of lower cauline leaves little or not at all exceeded by the petioles.
 Bracts mostly entire (sometimes with a pair of spiny teeth or bristles).
 Styles in fruit little or not at all exerted beyond calyx-lobes; bracts and bractlets glabrous.
 Stem diffusely branched from base; leaves serrate or incised; bracts callous-margined.....3. *E. armatum*.
 Stem erect, simple below; leaves twice pinnately parted; bracts scarious-winged at base.....4. *E. pinnatisectum*.
 Styles in fruit conspicuously exerted beyond calyx-lobes; bracts and bractlets puberulent.....5. *E. longistylum*.
 Bracts more or less spiny-toothed or bristly.
 Plants prostrate or low-diffuse.
 Stems thickened, nearly simple, clustered at base; basal leaves pinnatifid.....6. *E. minimum*.
 Stems slender, freely branched, not clustered at base; basal leaves oblanceolate, spinose-toothed.....7. *E. aristulatum*.
 Plants erect.
 Bractlets not spiny-toothed.....8. *E. jepsonii*.
 Bractlets spiny-toothed.
 Leaves merely spinose-toothed or somewhat incised; bracts and bractlets spiny-toothed only towards base.....9. *E. vaseyi*.
 Leaves laciniately parted into remote spinulose-toothed segments; bracts and bractlets spiny-toothed except towards tip.....10. *E. castrense*.
 Sepals pinnately 3 to 5-cuspidate.....11. *E. globosum*.

1. ***E. articulatum*** Hook. BLUE-THISTLE. Stem erect, dichotomously branched above, usually with a pedunculate head in the forks, 2 to 3 ft. high; herbage with a strong disagreeable odor; lower leaves fistulous, elongated, jointed, with or without a lanceolate or ovate nearly paralleled-veined entire to spinulose-lacinate blade; upper leaves sometimes opposite, more or less lacinate; heads ovoid, 4 to 8 lines high, blue; bracts narrowly linear-lanceolate, cuspidate-tipped, more or less spinulose-serrate, 6 to 10 lines long, deflexed; bractlets lanceolate, entire, or somewhat spiny-toothed, more or less scarious-margined, surpassing the sepals; sepals lanceolate, $1\frac{1}{2}$ lines long, tapering into a short spine, equaled or surpassed by the styles.—River marshes and marshy meadows; lower San Joaquin River; Sacramento Valley; north to Siskiyou and Modoc Cos.; Oregon to Idaho.

Locs.—Stockton, *Sanford*; Suisun Marshes, *Jepson*; Hamilton, Glenn Co., *Heller* 11558; Upper Fall River Valley, *Jepson* 5756; Sisson, *C. F. Baker* 3819 (cauline leaves like those in *E. alismaefolium*).

Var. **BAKERI** Jepson n. var. Stems simple for more than half their length, then sparsely branched, 1 to $1\frac{1}{2}$ ft. high; leaf blade of basal leaves ovate, $1\frac{3}{4}$ to 2 in. long, the petiole much elongated; heads ovate to globose, bluish, on longish peduncles, 4 to 5 lines high; bracts linear-lanceolate, pinnately spinescent, longer than the heads, spreading or often deflexed; bractlets with a pair of spinose teeth above the middle, scarious-margined at base, equaling or slightly exceeding the sepals; sepals ovate, $\frac{3}{4}$ line long, tapering rather abruptly into a short cusp, exceeded by the styles.—Modoc Co. This is an apparent intergrade to *E. alismaefolium* Greene.

Locs.—Egg Lake, *M. S. Baker* (type); Forestdale, *Baker & Nutting* (heads $5\frac{1}{2}$ lines long, terminal bractlets prominent); Little Grizzly ranger sta., Warner Mts., *L. S. Smith* 163.

Refs.—ERYNGIUM ARTICULATUM Hook. Jour. Lond. Bot. 6:232 (1847), "stony edges of the Spokane River, and Skitsoe and Coeur d'Alene lakes," *Ida., Geyer* 583; *Jepson*, Fl. W. Mid. Cal. 344 (1901). *E. harknessii* Curran, Bull. Cal. Acad.

1:153 (1885), type loc. Suisun Marshes, *Harkness*. Var. *BAKERI* Jepson, type loc. Egg Lake, near Larges, Modoc Co., *M. S. Baker*, Aug. 12, 1899.

2. *E. alismaefolium* Greene. Main stem 1 to 2 in. high, then parted into 3 to 5 diffuse dichotomous branches, at first much shorter than the leaves, later often exceeding them; basal leaves $\frac{1}{2}$ to $1\frac{1}{4}$ ft. long, consisting of elongated petioles with or without short ($1\frac{1}{4}$ in. long) blades; petioles terete, jointed, passing above into flat spinose ones without joints; upper leaves similar but much smaller; heads usually pedunculate, nearly globose, 3 to $3\frac{1}{2}$ lines high; bracts subulate-lanceolate, usually somewhat longer than the heads, 4 to 5 lines long, with or without a few spinose bristles, somewhat scarious-margined at base; bractlets subulate-lanceolate, a little exceeding the flowers, with conspicuous scarious margin below (broadening downward), with or without a few bristles; sepals ovate-oblong, scarious margined, $\frac{1}{2}$ line long, tapering into a cuspidate-bristly tip; styles longer than the sepals.—Modoc Co.

Loc.—Egg Lake, *M. S. Baker*, *Baker & Nutting*.

Refs.—*ERYNGIUM ALISMAEFOLIUM* Greene, *Erythra* 3:64 (1895), type loc. Egg Lake, Modoc Co., *Baker & Nutting*.

3. *E. armatum* C. & R. COAST *ERYNGO*. Fig. 1. Diffusely branching, the stems 3 to 5 or 10 in. long; leaves broadly oblanceolate, incised or merely serrate, the teeth spinose; bracts and bractlets very prominent, broadly lanceolate, strongly spinose-tipped, with a callous margin, entire or with a pair of spinulose teeth below, sometimes scarious-winged at the very base, 3 to 7 lines long; calyx lobes ovate, $\frac{3}{4}$ line long, usually exceeding the styles, narrowed at apex into a sharp point or cusp less than half as long.—Lowlands near the coast from Monterey Co. to Humboldt Co.; often abundant.

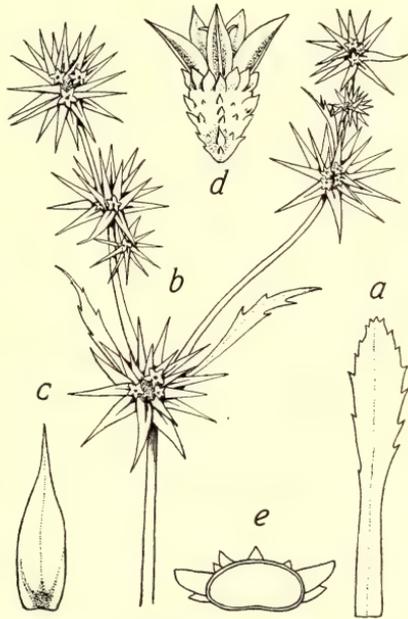
Locs.—Pacific Grove, *Jepson* 1163; Moss Beach, *K. Brandege* (bracts very broad at base); Berkeley, *Harriet Walker* 197; Pt. Reyes, *Jepson*; Petaluma, *Congdon*; Ft. Bragg, *W. C. Mathews* 163; Newport, Mendocino Co., *Jepson* 2212 (styles exserted beyond calyx lobes; bracts entire or with a spinulose tooth on each side); Shelter Cove, Humboldt Co., *Tracy* 4995 (heads bluish tinged).

Refs.—*ERYNGIUM ARMATUM* C. & R. *Bot. Gaz.* 13:141 (1888); *Jepson*, *Fl. W. Mid. Cal.* 343 (1901).

E. petiolatum var. *armatum* Wats. *Bot. Cal.* 1:255 (1876), based on spms. from Monterey Co. to Humboldt Co. (*Brewer, Samuels, Kellogg*).

E. HARMSIANUM Wolff in Fedde, *Rep. Nov. Sp.* 8:415 (1910), type from Cal., *Anderson*; related to *E. armatum*; bractlets auriculate-scarious at base (ex. char.), but so are they generally in our species.

4. *E. pinnatisectum* Jepson n. sp. Stems erect, branching above, 8 to 14 in. high; basal leaves 6 in. long, tapering into a flat winged petiole, pinnately parted into narrow rather remote segments, these spinulose-toothed or -parted; upper leaves similar or merely spinose-toothed, the petiole short or lacking; heads $3\frac{1}{2}$ to 4 lines high; bracts entire, 4 to 5 lines long, with wide scarious margin at



1. *Eryngium armatum* C. & R.; a, leaf x $\frac{1}{2}$; b, infl. x $\frac{3}{4}$; c, bract x 4; d, fr. x 4; e, sect. carp. x 7.

base forming a lobe or tooth above; bractlets shorter, similar; sepals lanceolate, 1 line long, tapering into a spine about $\frac{1}{2}$ as long; styles exceeded by sepals.—Sierra Nevada foothills in Tuolumne Co.

Loc.—Duffield Cañon, Soulsbyville, *Jepson* 7690, type (fruit unknown).

5. *E. longistylum* C. & R. Low (4 to 8 in. high), branching throughout and spreading; basal leaves narrow, pinnately cut into distant almost spine-like segments; heads globose, about $1\frac{3}{4}$ lines high; bracts narrowly lanceolate, spreading, minutely puberulent, much longer than the heads, $2\frac{3}{4}$ to $3\frac{3}{4}$ lines long, mostly entire, scarious-margined at base; bractlets similar, but narrower, and with broader scarious margins at base; sepals lanceolate, scarious-margined, $\frac{1}{2}$ line long, tapering above into a weak acuminate tip; styles very much longer than the sepals.—Western San Luis Obispo Co.

Loc.—San Simeon, *Curran*.

Refs.—ERYNGIUM LONGISTYLYM C. & R. Contrib. U. S. Nat. Herb. 7:55 (1900), type loc. San Simeon, San Luis Obispo Co., *Curran*.

6. *E. minimum* C. & R. Low, depressed-tufted, the stems several to many and the leaves mostly basal; stems nearly simple, thickened toward the base and markedly retrocurved, 1 to 4 in. long; leaves 2 to 6 in. long, merely cleft and toothed to pinnately divided with cleft or toothed ovate segments, the teeth and petioles more or less spinose; heads on very short peduncles, nearly globose, $2\frac{1}{2}$ to $3\frac{1}{2}$ lines high; bracts broadly lanceolate, equaling or slightly exceeding the heads, the lower $\frac{2}{3}$ with spinose bristles; bractlets broadly linear-lanceolate, a little longer than the flowers, with a conspicuous scarious margin below, at the top of which and just above are a few bristles; sepals ovate, scarious-margined, $\frac{1}{2}$ line long, with an abruptly cuspidate-bristly tip about as long; styles exceeding the sepals.—Northern Sierra Nevada (Nevada Co. to Plumas Co.)

Locs.—Donner Lake, *Sonne*, *Heller* 7061; Plumas Co., *R. M. Austin*.

Refs.—ERYNGIUM MINIMUM C. & R. Contrib. U. S. Nat. Herb. 7:54 (1900). *E. petiolatum* var. *minimum* C. & R. Rev. N. Am. Umbell. 98 (1888), type loc. Donner Lake, *Sonne*. *E. articulatum* var. *microcephalum* C. & R. l. c. 99, type loc. Plumas Co., *R. M. Austin*.

7. *E. aristulatum* Jepson. Prostrate or low-diffuse, very slender, the stems 10 to 15 in. in length; basal leaves tapering into a long petiole, 4 in. long (including the petiole), the short blade spinose-toothed and with a few lanceolate segments; cauline leaves opposite, sessile, spinulose-serrate; heads very numerous, $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long; bracts exceeding the head, about $4\frac{1}{2}$ lines long, densely spinescent at base; bractlets spinose, the body narrowly lanceolate, inversely sagittate-winged from the base upward, the lobes of the wings thus forming sinuses, in each of which are borne 1 to 3 awns surpassing the breadth of the wing; calyx lobes ovate-lanceolate, hyaline-margined, 1 line long, tapering into a cuspidate-bristly tip, exceeded by the long styles.—Dry lake beds, Lake Co.

Locs.—Mt. Konociti (Uncle Sam Mt.), *Jepson*; Boggs Lake, Bottle Glass Mt., *K. Brandegee*; Scotts Valley, *Tracy* 2375 (stems somewhat retrocurved, apparently not prostrate, bracts much longer than heads, sepals rather abruptly cuspidate).

Refs.—ERYNGIUM ARISTULATUM Jepson, *Erythra* 1:62 (1893), type loc. mts. s. of Uncle Sam Mt., Lake Co., *Jepson*.

8. *E. jepsónii* C. & R. BUTTON-THISTLE. Plants growing in shallow vernal pools, the earliest leaves all basal and consisting of terete hollow pointed petioles, $\frac{1}{2}$ to $1\frac{1}{2}$ ft. long, these disappearing with the drying up of the pools, and leafy stems arising; stems slender, freely branching, $1\frac{1}{4}$ to $1\frac{3}{4}$ ft. high; leaves oblanceolate, spinulose, sometimes incised, the lower narrowed at base to a slender spinulose petiole, the upper short-petioled or sessile; heads 3 to $3\frac{1}{2}$ lines high, surpassed by the bracts; bracts rigid, 4 to 10 lines long, with few short bristles at base; bractlets lanceolate, with scarious margin at base, broader upwards, not spinulose; sepals oblong or lanceolate, 1 line long, narrowed abruptly into a spine less than half as long, exceeded by the long styles.—Low places in valley fields and flats in the hills, Napa Co. to Santa Clara Co.

Locs.—Yountville, *Jepson*; Orinda Park, Contra Costa Co., *Jepson*; Berryessa, Santa Clara Co., *R. J. Smith* 35.

Var. *PARISHII* Jepson n. comb. Stems slender, erect or spreading, much branched at base, $\frac{1}{3}$ to $1\frac{1}{3}$ ft. high; basal leaves laciniate-toothed or parted into remote spinose-toothed segments, tapering into a long somewhat spiny-toothed petiole; inflorescence beginning near the base and diffusely branching, the heads about $2\frac{3}{4}$ lines high; bracts narrow and rigid, with a few spinose bristles and with or without a narrow scarious margin at base, $3\frac{1}{2}$ to 6 lines long; bractlets similar but with a short broad scarious margin below, usually without bristles; sepals ovate, $\frac{1}{2}$ line long, tapering above into a cuspidate-bristly tip.—Sandy ground, San Luis Obispo Co. to San Diego Co. and Lower California.

Locs.—San Diego, *Jepson* 1599; Oceanside, *Parish* 4436.

Refs.—*ERYNGIUM JEPSONII* C. & R. Contrib. U. S. Nat. Herb. 7:54 (1900); type loc. near Orinda Park, Contra Costa Co., *Jepson* in 1895. *E. californicum* Jepson, Fl. W. Mid. Cal. 343 (1901), type loc. Yountville, *Jepson*. Var. *PARISHII* *Jepson*. *E. parishii* C. & R. l. c. 57, type loc. Oceanside, *Parish* 4436.

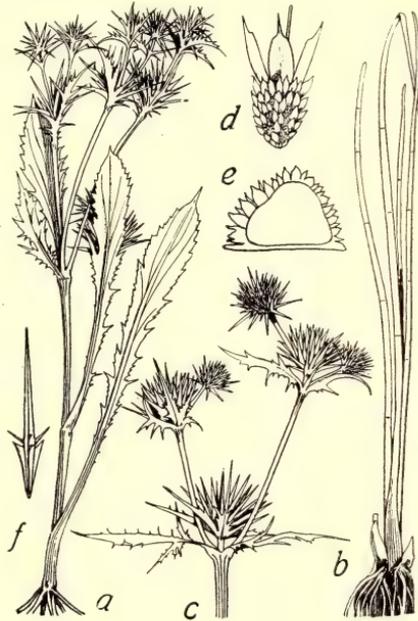
E. ELONGATUM C. & R. Contrib. U. S. Nat. Herb. 7:53 (1900), type loc. near San Francisco, *Vasey*. Upper leaves tapering into spinulose-winged petioles; heads 7 lines long; bracts weak and becoming reflexed; scarious margin of bractlets broader toward base (ex. char.). A specimen from Wells Hill, upper Vaca Valley, *Jepson*, referred doubtfully by C. & R. l. c., to this species, has sepals (about 1 line long) tipped with a weak spine of about equal length.

9. *E. vaseyi* C. & R. COYOTE-THISTLE. Fig. 2. Plants growing in shallow vernal pools and showing two vegetative stages: earliest leaves all terete, jointed, and basal, disappearing with the drying up of the pools and succeeded by leafy stems; stems stout, erect, more or less branching, commonly 8 to 13 in. (or sometimes 2 ft.) high; lower leaves narrowly oblanceolate, spinulose, somewhat incised or bearing small lanceolate lobes below, 4 to 8 in. long, the upper much shorter; heads $3\frac{1}{2}$ (or $2\frac{1}{2}$ lines) high; bracts spinose, spinulose toward the base, 6 to 10 lines long, much surpassing the bractlets; bractlets similar, surpassing the flowers; fruit with abruptly cuspidate calyx-lobes longer than the short styles.—Low places in fields, Sacramento Valley, west to Mendocino Co. and south to Monterey Co. May-June.

Locs.—Red Bluff, comm. *Ethel W. Wickes*; Vacaville, *Jepson*; Little Oak, Solano Co., *Jepson*; Elmira, *Jepson*; Middle Eel River to Round Valley, *Jepson*.

Closely allied is the var. *OBLANCEOLATUM* Jepson n. comb. Bracts with conspicuous scarious margin.—Solano and Napa Cos. to San Diego Co.: Vanden, Solano Co., *Jepson*; St. Helena, *Jepson*; Yountville, *Jepson*; Madrone, Santa Clara Co., *Jepson*; San Luis Obispo, *Jepson* 3070; San Diego, *T. Brandegee* 1628.

Refs.—*ERYNGIUM VASEYI* C. & R. Bot. Gaz. 13:142 (1888), type loc., San Antonio River, Monterey Co., *Vasey* 222; *Jepson*, Fl. W. Mid. Cal. 343 (1901). Var. *OBLANCEOLATUM* *Jepson*. *E. oblanceolatum* C. & R. l. c. 7:56 (1900), type loc. Sonoma Valley, *Torrey* 159.



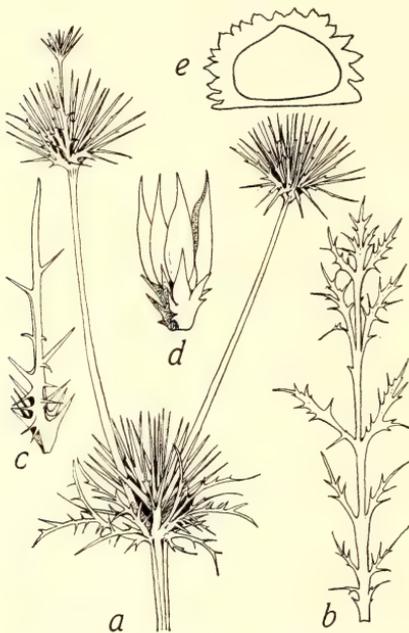
2. *Eryngium vaseyi* C. & R.; a, plant x $\frac{1}{4}$; b, leaves x $\frac{1}{4}$; c, fr. branch x $\frac{1}{2}$; d, fr. x 3; e, sect. x 7; f, bractlet x 2.

10. *E. castrénse* Jepson n. sp. Fig. 3. Stem stout, very erect, simple below, branched above, $1\frac{1}{2}$ to $1\frac{3}{4}$ ft. high; cauline leaves laciniately divided into rather remote very narrow segments, these again cleft or toothed, the margin of the divisions and the ligulate rachis spinose; leaves at the upper forks bracteose-foliaceous, pinnately spinose-cleft, somewhat recurving, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long; heads mostly short-peduncled, 4 to 5 lines high, twice exceeded by the bractlets; bracts moderately rigid, pinnately spiny-toothed except toward tip, at base more or less scarious margined and densely spinose dorsally, $\frac{3}{4}$ to 1 in. long; bractlets similar but with broadly scarious margined base which encloses the fruit; sepals about 1 line long, tapering into a short spine.—Northern Sierra Nevada foothills from Tuolumne Co. to Butte Co.

Locs.—Chinese Camp, Tuolumne Co., *Jepson* 6319 (type); Pentz, Butte Co., *Heller* 11472 (stout; heads 6 lines high).

Var. *VALLICOLUM* Jepson n. var. Bracts and bractlets shorter and less markedly spinose, in this character approaching *E. vaseyi*.—Sierra Nevada foothills from Mariposa Co. to Butte Co.

Locs.—Escalon, San Joaquin Valley, *Jepson* (type); Chico, *R. M. Austin* 826 (leaves more coarsely lacinate and less spiny).



3. *Eryngium castrénse* Jepson; a, fr. branchlet $\times \frac{1}{2}$; b, leaf $\times \frac{1}{2}$; c, bractlet $\times 1\frac{1}{2}$; d, fr. $\times 5$; e, sect. carp. $\times 12$.

long, pinnately 3 to 5 spiny-toothed (rarely entire), the apical spine $\frac{1}{2}$ line long; styles scarcely exerted; fruit $1\frac{1}{2}$ lines long.—Flats in and near the Sierra Nevada foothills in Tulare Co.

Locs.—Kaweah, *Geo. B. Grant* 2894 (immature, some of the heads sessile); Lemon Cove *Jepson* 558 (heads 6 to 7 lines high; bractlets with 1 to 3 spines at upper edge of scarious margin, a little exceeding the head); Exeter, *K. Brandegee* (type).

Var. *MEDIUM* Jepson n. var. Bractlets conspicuously exerted from the heads, in this respect approaching *E. vaseyi*.—Cathay foothills, Mariposa Co., *Jepson* 8409 (one individual with spiny main stem).

11. *E. globosum* Jepson n. sp. Stems 1 to several from base, branching above, 14 to 20 in. high; basal leaves pinnately divided into narrow distant segments, these more or less spinose-toothed or cleft, the petioles spinose-winged and at base somewhat clasping, the entire leaf 5 in. long; cauline leaves similar but smaller with short spinosely winged petiole, the uppermost more or less bracteose, very spiny at base; heads remarkably globose, mostly on short stout peduncles, 5 lines in diameter, not exceeded by the bractlets except the terminal ones; bracts rigid, spine-tipped and pinnately spinose, somewhat scarious at base, 4 to $5\frac{1}{2}$ lines long; bractlets pinnately 2 or 3-spinose, with broad scarious margin at base, the margin 1 or 2-spinose above; lateral bractlets equaling the flowers, the terminal ones much longer, all falling with the fruit; sepals ovate, 1 line

2. *SANÍCULA* L. SNAKE-ROOT

Glabrous perennials with naked or few leaved stems, usually much divided leaves, and irregularly compound, few-rayed umbels. Involucres of leaf-like toothed bracts. Involucels of small usually entire bractlets. Flowers greenish, yellow or purple, of two sorts, perfect (fertile) and staminate (sterile), both kinds in the same umbellet, the staminate often pediceled. Umbellets capitate and here called "heads." Calyx teeth slightly foliaceous, persistent. Fruit subglobose or obovoid, without ribs, densely covered with tubercles which often end in hooked prickles. Oil-tubes many and irregularly distributed. (Diminutive, derived from Latin sanare, to heal; certain species used in medicine.)

4. *Sanicula arctopoides* H. & A.; fl. head and leaf x 2.

**A. Fruit pediceled or stipitate; leaves palmately lobed or divided;
stem or stems from a stoutish tap-root.**

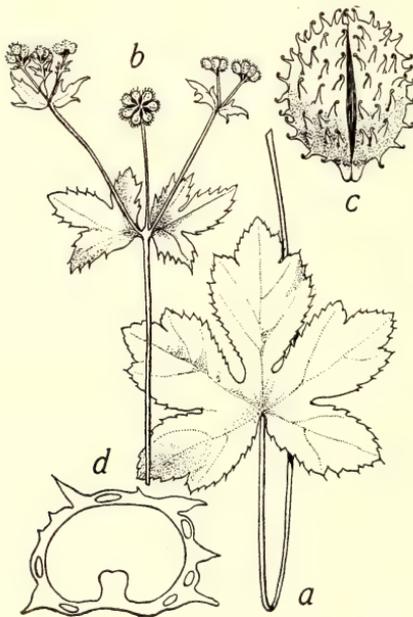
- Bractlets conspicuous, much exceeding the heads; plants prostrate or decumbent.....1. *S. arctopoides*.
 Bractlets inconspicuous, not exceeding the heads; plants erect.
 Leaf divisions broad, not toothed to the very base; common.....2. *S. menziesii*.
 Leaf divisions narrow, decurrent below into a conspicuously toothed rachis; rare.....3. *S. arguta*.

B. Fruit neither pediceled nor stipitate.

- Stem or stems from the more or less thickened crown of a tap root.
 Flowers purple (yellow in the vars.); leaves bipinnatifid, the main divisions decurrent on the toothed rachis.....4. *S. bipinnatifida*.
 Flowers yellow.
 Leaves entire or some 3-parted; S. F. Bay.....5. *S. maritima*.

- Leaves not entire.
 Leaves palmately cleft or divided, the main divisions confluent below; coast species
6. *S. laciniata*.
 Leaves ternate, the main divisions on distinct petiolules; Sierra Nevada, San
 Bernardino Mts.
 Plants low, the spreading peduncles arising in a cluster from near the base....
7. *S. nevadensis*.
 Plants erect, the peduncles arising singly along the stem.....8. *S. septentrionalis*.
- Stems from a tuberous root.
 Leaves twice or thrice pinnate, of distinct small leaflets; fruit tuberculate, the tubercles
 tipped with hooked bristles; tuber vertically elongated.....9. *S. bipinnata*.
 Leaves twice or thrice ternate, then pinnately dissected.
 Tuber globose; fruit tuberculate, not bristly; flowers yellow.....10. *S. tuberosa*.
 Tuber elongated, fleshy, branched below; fruit with its upper tubercles tipped with
 hooked bristles; flowers salmon color.....11. *S. saxatilis*.

1. *S. árctopoïdes* H. & A. FOOTSTEPS-OF-SPRING. Fig. 4. Prostrate or decumbent, the plants 4 to 8 inches broad, conspicuous because of the yellowish foliage; main stem from a tap root, very short, bearing a tuft of leaves and several divergent naked branches often longer than the leaves, each branch bearing an umbel of 1 to 4 rays; rays short or as much as 5 inches long; leaves 2 to 2½ inches broad, 2 to 4½ inches long, including the broadly margined petiole, palmately parted into 3 divisions which are again cleft, the whole margin laciniately cut into slender unequal teeth, almost as if fringed, or again, the lanceolate spreading segments subentire; bracts similar; heads 3 lines in diameter, surrounded by conspicuous involuclcs of 8 to 13 oblong entire bractlets 5 to 7 lines long, or 4 or 5 much shorter than the others; flowers yellow; fruit 1 to 1½ lines long, naked at base, with strong bristles above.—Open or brushy hills of the seaward Coast Ranges from Monterey to Humboldt Co. and northward to British Columbia. Also called Yellow Mats.



5. *Sanicula menziesii* H. & A.; a, leaf x ½;
 b, fr. branchlet x ½; c, fr. x 5;
 d, sect. carp. x 6.

Locs.—Monterey, *Jepson* 2989; Santa Cruz, *Setchell* (leaf segments very broad); Burlingame, San Mateo Co., *Inez Ray Smith* (leaf divisions and teeth broad to very narrow); Lake San Andreas, *Jepson* 9535; Lake Merced, San Francisco, *Tracy* 1777; Olema, *Jepson*; Inverness, *Jepson* 501; betw. Stewarts Pt. and Sea View, Sonoma Co., *M. S. Baker* 6; Mendocino, *H. E. Brown* 734 (leaf segments very broad); Samoa, Humboldt Bay, *Tracy* 1018 (main stem 2 in. long).

Refs.—SANICULA ARCTOPOIDES H. & A. Bot. Beech. 141 (1832), type from Cal., *Lay and Collie*; Hook. Fl. Bor. Am. 1:258, pl. 91 (1834); *Jepson*, Fl. W. Mid. Cal. 344 (1901); *Wolff* in *Engler Pflzr.* 4²²⁸:71, Fig. 12 (1913)

2. *S. menziesii* H. & A. GAMBLE WEED. Fig. 5. Stem 1 to 3½ feet high, from a stoutish tap-root, simple below, paniculately branching above; leaves round-cordate in outline, 1 to 3 inches broad, palmately and deeply 3 to 5-lobed, the broad segments sharply lobed or incised, with mucronate teeth; rays few, ¼ to 2 inches long; bracts small, leaf-like; bractlets 6 to 8, small, entire; flowers yellow, the sterile ones

short-pediceled or nearly sessile; fruit covered with strong bristles, $1\frac{1}{2}$ lines long, distinctly stipitate, 4 to 9 in each head, at length divergent.—Shady woods of the foothills from coastal Southern California north through both the Coast Ranges and Sierra Nevada to British Columbia.

Locs.—Waterman Cañon, San Bernardino Mts., *Parish*; Ojai Valley, *Hubby* 3; Fort Tejon, Kern Co., *Davy* 2363; Pacific Grove, *Heller* 6824; Stanford, *C. F. Baker* 714; Berkeley, *Jepson* 6225; Pine Cañon, Mt. Diablo, *Chandler* 952; Calistoga, *Jepson*; Miyakma Range (se. of Ukiah), *Jepson* 3019; Comptche, Mendocino Co., *Harriet Walker* 264; Buck Mt., Humboldt Co., *Tracy* 2748; Crane Creek, w. Tehama Co., *Jepson*; Vina, Tehama Co., *Heller* 11332; Marysville Buttes, *Jepson*; Gwin Mine, Calaveras Co., *Jepson* 1764; Mariposa Co. (*Zoe* 3:29). Not known in the Sierra Nevada foothills from Madera Co. to Kern Co.

Var. *NUDICAÛLIS* Jepson n. comb. Branches about 10, sub-basal, somewhat scapiform; leaves long-petioled, thinnish, less deeply parted, sinuses more nearly closed and the segments less lobed.—Coast Ranges, *Douglas*; Amador Co., 900 ft., *Hansen* 1451. Var. *PEDAÛTA* Jepson n. var. Robust, 3 to 5 ft. high; leaves thickish, dark green, pedately divided into cuneate segments (especially the cauline), 3 to 4 in. broad, the teeth bristle-tipped.—North Coast Ranges: Elk Mt., Lake Co., *Tracy* 2274; Calistoga, *Jepson* (type). Var. *FOLIACEA* Jepson n. var. Low but very leafy, the bracteal leaves very large.—San Francisco Bay, *Hartweg* 199; Kelseyville, Lake Co., *Irwin* 127 (type).

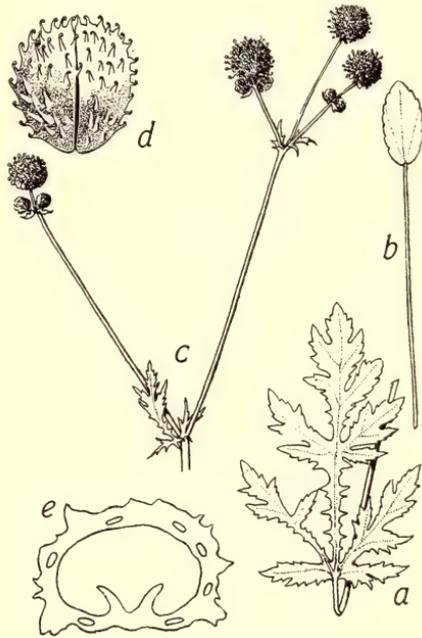
Refs.—*SANICULA MENZIESII* H. & A. Bot. Beech. 142 (1832), type from Cal., *Lay & Collie*; Hook. Fl. Bor. Am. 1:258, t. 90 (1834), *Jepson*, Fl. W. Mid. Cal. 345 (1901). Var. *NUDICAULIS* Jepson. *S. nudicaulis* H. & A. l. c. 347 (1840), type from Cal., *Douglas*.

3. *S. arguta* Greene. Stem sparingly branched, from the crown of a thickened tap root, 8 to 14 inches high; leaves mainly basal, 1 to 3 inches long, palmately 5- to 7-divided, the middle division largest and often distant, the lower pair of divisions smaller than the lateral pair, all more or less pinnately parted or cleft and toothed and each decurrent to the base, forming a broad toothed wing; ultimate segments 2 to 3 lines broad; midribs and upper side of petioles minutely glandular; petioles 2 to 5 inches long; cauline and bracteal leaves reduced or sometimes large; rays 3 to 5 in an umbel, 1 to 4 inches long; flowers yellow, the heads 2 or 3 lines broad; bractlets membranaceous, oblong, acute, not exceeding the heads; fruit prickly, $2\frac{1}{2}$ lines long, stipitate.—Coastal Southern California.

Locs.—Saugus, *Davy*; Pasadena, *Geo. B. Grant* 1174a; Santa Catalina Isl., *Blanche Trask* in 1903 (fl. & fr.); Santa Barbara, *Elmer* 3930; Ojai Valley, *F. W. Hubby* 14; San Diego, *Jepson* 6664; Escondido, *Abrams* 3353.

Refs.—*SANICULA ARGUTA* Greene; C. & R. Contrib. U. S. Nat. Herb. 7:36 (1900), type loc. San Diego, *Pringle*; Wolff in Engler, Pflzr. 4²²⁸:73 (1913).

4. *S. bipinnatifida* Dougl. PURPLE SANICLE. Fig. 6. Plants $\frac{1}{2}$ to 1 foot high, the herbage disposed to be purplish; tap root deep-seated,



6. *Sanicula bipinnatifida* Dougl.; a, typical leaf $\times \frac{1}{2}$; b, early leaf $\times 3$; c, infl. $\times \frac{1}{2}$; d, fr. $\times 3$; e, sect. carp. $\times 6$.

its thickened multicapital crown bearing a cluster of leaves and several stems which are leafy mainly or wholly toward the base; leaves $2\frac{1}{2}$ to 4 inches long, mostly triangular in outline, pinnately 3 to 7-parted, the divisions distant, decurrent on the rachis as a toothed wing, and cut into oblong or ovate unequally toothed or serrate lobes; flowers purple, the sterile pediceled, borne in dense heads $2\frac{1}{2}$ to 4 lines in diameter; umbels irregular, with long or short rays, small leaf-like bracts and small lanceolate bractlets; fruit covered all over with bristles.—Grassy slopes in the hills: Coast Ranges and Sierra Nevada foothills, southward to Southern California and northward to British Columbia. May-June.

Locs.—Sierra Nevada: Goose Valley, Shasta Co., *Baker & Nutting*; Oroville, *Heller* 11,206; New York Ravine, Eldorado Co., *K. Brandegee*; Gwin Mine, Calaveras Co., *Jepson* 1782; Columbia, Tuolumne Co., *Jepson* 6289; Mariposa, *Congdon*; Rowen, Tehachapi Mts., *Jepson* 6712, 6729; Tulare, *Davy*. Coast Ranges: Rosewood, w. Tehama Co., *Jepson*; Alton, Humboldt Co., *Tracy* 4478; Round Valley, Mendocino Co., *Westerman*; Leesville, Colusa Co., *T. Brandegee*; Kelseyville, Lake Co., *Irwin* 28; Vacaville, *Jepson*; Chiles Creek hills, Napa Range, *Jepson* 6267; Violet sta., Vacaville, *Jepson* 1200; Mt. Hamilton, *Jepson* 4212; Coyote Creek, Santa Clara Co., *Jepson*; San Luis Obispo Co., *Barber*. Southern California: San Bernardino, *Parish*; Cuyamaca Mts., *Hall*; El Cajon, San Diego Co., *T. Brandegee*.

Leaf multimorphism.—During the course of development from the seedling to the mature plant the leaf shows a considerable range of variation in size, shape and segmentation, while in many individuals this range of variation is rather remarkable. The successive phases are as follows: The earliest leaves are simple, suborbicular, the margin minutely or obscurely crenulate, rarely 3-lobed; next come leaves which are elliptical to oblong-ovate, serrulate to deeply serrate; in the third phase they are broadly ovate in outline, deeply cleft towards the base so as to be trilobate, the terminal lobe much the largest, all the lobes coarsely crenate-serrate; in the fourth phase the 3 main lobes are deeply cleft or somewhat lobate; in the fifth phase the leaf is pinnately divided into 5 to 7 ovate lobes, each pinnately more or less toothed or lobed; finally, the divisions of the pinnate leaf are deeply pinnatifid with narrow toothed segments. The above note rests on the following specimens: Columbia, Tuolumne Co., *Jepson* 6289; Claremont Cañon, Berkeley, *Lewis & Robinson*.

Var. FLAVA *Jepson* n. var. Leaves mostly light green with broad primary divisions ($\frac{3}{4}$ to $1\frac{1}{2}$ inches wide); flowers yellow.—Northern Sierra Nevada: Betw. Clear Creek and Paradise, Butte Co., *Heller & Brown* 5539; Marston sta., Plumas Co., *Heller* 10,839 (type). Little Chico Creek, *R. M. Austin*, is a purple flowered form. Var. NEMORALIS *Jepson* n. comb. Winged rachis entire or sparsely denticulate; flowers yellow.—Northern Sierra Nevada: Merced Big Trees and Yosemite Valley, *Bolander*; New York Falls, Amador Co., *Hansen* 1298 (flowers yellow, rachis very sparsely toothed); Kress, Nevada Co., *Hall & Essig* 10,196 (rachis-wing toothed in some cases); Columbia, *A. L. Grant* 681 (only portions of the winged rachis entire).

Refs.—SANICULA BIPINNATIFIDA *Dougl. Hook. Fl. Bor. Am.* 1:258, t. 92 (1834), type loc. Ft. Vancouver on the Columbia River, *Douglas, Scouler*; *Jepson Fl. W. Mid. Cal.* 345 (1901). Var. FLAVA *Jepson*. Var. NEMORALIS *Jepson*. *S. nemoralis* *Greene, Erythra* 1:6 (1893), type loc. Big Trees and Yosemite Valley, *Bolander*.

5. *S. maritima* *Kellogg*. DOBIE SANICLE. Plants 10 to 12 inches high, the stout stem from a much-thickened root; basal leaves rather numerous, elliptical to orbicular, entire or slightly serrate, 1 to 2 inches long, on petioles 4 to 6 inches long; cauline leaves few, 3-parted into obovate or roundish divisions (as are sometimes the basal leaves), with sub-entire or coarsely toothed margins; peduncles few, elongated; umbel with 1 to 4 rays 1 to $2\frac{1}{2}$ inches long; involucre of leaf-like bracts; involucre of many small lanceolate bractlets; flowers yellow, the sterile ones short-pediceled; fruit bristly, somewhat naked below, $1\frac{1}{2}$ lines long; seed-face concave with a very prominent median longitudinal ridge.—Local species of low and wet adobe lands in the vicinity of salt-marshes bordering San Francisco Bay.

Locs.—Potrero, San Francisco, *E. Cannon*; Alameda, *Greene*.

Refs.—*SANICULA MARITIMA* Kellogg; Wats. Bot. Cal. 2:451 (1880), type loc. near the coast about San Francisco, *Kellogg*.

6. *S. lacinia* H. & A. COAST SANICLE. Plants 6 to 13 inches high; stem from a medium tap root, the branches few and disposed to diverge; leaves mainly basal, roundish in outline, $\frac{1}{2}$ to 1 inch long, palmately 3-cleft or parted, the divisions incisely lobed or lacinate with spreading teeth, their petioles 1 to 2 inches long; upper leaves and foliaceous involucre similar but reduced; umbel with 2 to 5 unequal rays ($\frac{1}{3}$ to $1\frac{1}{2}$ inches long) or 1 or 2 of the rays again umbellate; flowers yellow, subtended by an involucre of oblong-ovate or lanceolate bractlets 1 line long; sterile flowers long-pedicelated; fruit prickly, somewhat naked below, $1\frac{1}{2}$ lines long.—Slopes of the coast hills from Humboldt Co. to Monterey Co. Apr.

Locs.—Humboldt Co. (Bot. Cal. 1:256); Navarro, Mendocino Co., *Edith Byxbee* (earlier leaves sometimes circular-cordate, nearly entire); Franz Valley grade, nw. Napa Co., *Jepson*; Mt. Tamalpais, *Jepson* 1191; Stanford, *C. F. Baker*; Monterey, *Jepson* 2988.

Var. *SERPENTINA* Jepson n. comb. Leaves 1 to $1\frac{1}{2}$ inches long, palmately 3-parted, or divided, the lobes pinnately parted into often remote lanceolate segments, these entire or lacinate toothed.—Monterey Co. to Marin Co.

Locs.—Pacific Grove, *Heller* 6479; Portola, San Mateo Co., *Elmer* 4498; Liberty, Marin Co., *Chestnut & Drew*.

Refs.—*SANICULA LACINIATA* H. & A. Bot. Beech. 347 (1840), type from Cal., *Douglas*; *Jepson*, Fl. W. Mid. Cal. 345 (1901). Var. *SERPENTINA* Jepson. *S. serpentina* *Elmer*, Bot. Gaz. 41:312 (1906), type loc. Portola, San Mateo Co., *Elmer* 4498.

7. *S. nevadensis* Wats. SIERRA SANICLE. Low plants, with several spreading peduncles 1 to 6 (or 9) inches long arising basally or from the very short stem; leaves about 1 inch long, on petioles as long or twice as long, ternate, the divisions with distinct petiolules, oblong-ovate to roundish in outline, 3 to 5-lobed with the segments again lobed or toothed; rays 3 to 10 in an umbel, scarcely 1 line to 1 inch long, the bracts pinnatifid, leaf-like; bractlets small, oblong, acute, more or less united; flowers yellow, the sterile on pedicles 1 to $1\frac{1}{2}$ lines long; fruit tuberculate, the tubercles ending in hooked bristles.—Middle altitudes in the mountains, 5000 to 6000 ft.: San Bernardino Mts. and northward through the Sierra Nevada to Modoc and Siskiyou Cos. May-June.

Locs.—Long Point, San Bernardino Mts., *Parish*; Bear Mt., Tehachapi Range, *Jepson* 7176; Tahoe, Placer Co., *Sonne*; Prosser Creek near Truckee, *Sonne*; Forestdale, Modoc Co., *Baker & Nutting*; Deep Creek, Warner Mts., *L. S. Smith* 1124; Humbug divide, Siskiyou Co., *Butler* 623; Devils Backbone, w. Siskiyou Co., *Jepson* 2068.

Var. *GLAUCA* Jepson n. var. Leaves glaucous, very finely divided.—Rocky slopes, Pah Ute Pass, *Purpus* 5093 (type); Middle Tule River, *Purpus* 1804.

Refs.—*SANICULA NEVADENSIS* Wats. Proc. Am. Acad. 11:139 (1876), type from Plumas Co., *M. E. P. Ames, Lemmon*. Var. *GLAUCA* Jepson.

8. *S. septentrionalis* Greene. Plants erect, 6 to 12 inches high; peduncles few, divaricately spreading, scattered along the stem; leaves 1 to 2 inches long; fruit 2 lines long; otherwise like No. 7.—Montane, 5000 to 7000 ft.; Sierra Nevada (Tulare Co. to Siskiyou Co.); high North Coast Ranges. Northward to British Columbia.

Locs.—Colony Mill to Marble Fork, *Jepson* 656; Big Valley Mts., *Baker & Nutting*; Shackelford Creek, Siskiyou Co., *Buller* 54, 1778; Dorleska, Trinity Co., *Hall* 8587; Trinity Summit, *Jepson* 2046; South Yolo Bolly, *Jepson*.

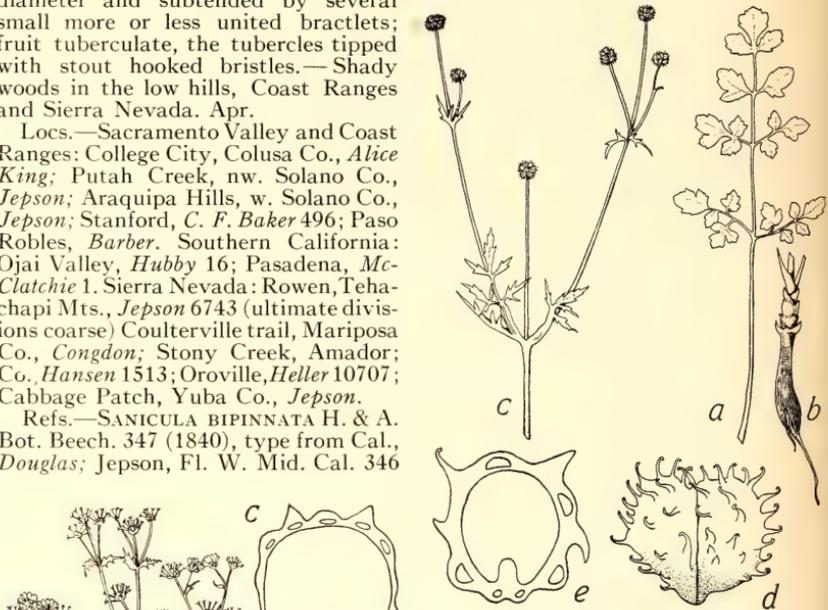
Refs.—*SANICULA SEPTENTRIONALIS* Greene, *Erythra* 1:6 (1893), type loc. Chase River, Vancouver Isl., *Macoun*; Wolff in Engler, Pflzr. 4228:75, fig. 14 (1913). *S. divaricata* Greene, *Erythra* 3:64 (1895), type loc. Castle Peak, Nevada Co., *Greene*.

9. *S. bipinnata* H. & A. POISON SANICLE. Fig. 7. Stem from an elongated tuber-like root, erect, usually simple below, $\frac{3}{4}$ to 2 feet high; herbage with a strongly aromatic odor; leaves chiefly basal, 2 to 4 inches long, twice or thrice

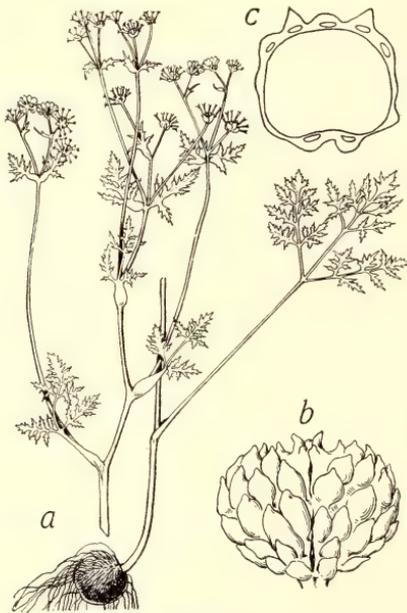
pinnate, the ultimate divisions obovate or oblong, 3 to 4 lines long, not decurrent; umbel with 3 or 4 rays and leaf-like bracts; flowers yellow; the heads 2 lines in diameter and subtended by several small more or less united bractlets; fruit tuberculate, the tubercles tipped with stout hooked bristles.—Shady woods in the low hills, Coast Ranges and Sierra Nevada. Apr.

Locs.—Sacramento Valley and Coast Ranges: College City, Colusa Co., *Alice King*; Putah Creek, nw. Solano Co., *Jepson*; Araquipa Hills, w. Solano Co., *Jepson*; Stanford, *C. F. Baker* 496; Paso Robles, *Barber*. Southern California: Ojai Valley, *Hubby* 16; Pasadena, *McClatchie* 1. Sierra Nevada: Rowen, Tehachapi Mts., *Jepson* 6743 (ultimate divisions coarse) Coulterville trail, Mariposa Co., *Congdon*; Stony Creek, Amador Co., *Hansen* 1513; Oroville, *Heller* 10707; Cabbage Patch, Yuba Co., *Jepson*.

Refs.—*SANICULA BIPINNATA* H. & A. Bot. Beech. 347 (1840), type from Cal., *Douglas*; *Jepson*, Fl. W. Mid. Cal. 346



7. *Sanicula bipinnata* H. & A.; a, leaf $\times \frac{1}{2}$; b, root $\times \frac{1}{2}$; c, fr. branchlet $\times \frac{1}{2}$; d, fr. $\times 4$; e, sect. carp. $\times 7$.



8. *Sanicula tuberosa* Torr.; a, habit $\times \frac{1}{2}$; b, fr. $\times 7$; c, sect. carp. $\times 10$.

2500 feet and up to 5000 feet, Coast Ranges and Sierra Nevada, southward to San Diego Co. and Lower California.

(1901); Wolff in Engler, Pflzr. 4²²⁸:77, fig. 15 (1913).

10. *S. tuberosa* Torr. TURKEY PEA. Fig. 8. Stem from a globose tuber, 5 to 9 (or 14) inches high, simple or divided at or near the surface of the ground into 2 to 5 long peduncle-like often divergent branches, each irregularly di- or trichotomous, the divisions ending in 1 to 4-rayed umbels and commonly with pedicelate heads in the forks; leaves once or twice ternate, then pinnatifid, usually very finely dissected into acutish segments; involucre of leaf-like bracts; involucre of small ovate or lanceolate partially united bractlets; heads 2 to 3 lines broad; flowers yellow, the sterile on pedicels 1 to $2\frac{1}{2}$ lines long; fruit flattened laterally, tuberculate but not at all bristly, 1 line long.—Rocky or gravelly slopes in the foothills, 500 to

(To be continued)

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Schedule of Field Trips and Meetings

JANUARY-JUNE, 1923



- Sunday, Jan. 21.** Angel Island. Leave Fort Mason, foot of Van Ness Ave., on Government boat at 10 a. m. From San Francisco ferry take Union St. cars. Leader, Mr. W. S. Fields.
- Saturday evening, Jan. 27.** Annual dinner in the Y. W. C. A. cottage, Allston Way and Union St., Berkeley, at 5:30. There will be on exhibition in the living room of photochrome reproductions of the Alpine flora of Switzerland.
- Sunday, Feb. 4.** Tennessee Cove. Take 8:45 a. m. Sausalito boat from San Francisco to Manzanita. Leader, Mr. A. F. Walker.
- Sunday, Feb. 18.** Las Trampas Ridge. Take Sacramento Short Line, 40th and Shafter Sts., Oakland, at 8:30 a. m. to Cashion. Leader, Dr. P. B. Kennedy.
- Monday evening, Feb. 26.** Special meeting in room 11, Wheeler Hall, University of California campus, at 7:50. Lecture by Mrs. Julia Henshaw, F.R.G.S., on the topography, plants and animals of Vancouver Island, illustrated by 100 colored slides.
- Sunday, March 4.** Mount Davidson. Meet at entrance of upper waiting room, San Francisco ferry building, at 9 a. m. Take "K" car to end of Twin Peaks Tunnel. Leader, Dr. W. C. Blasdale.
- Thursday, March 15, 8 p. m.** Regular meeting in 212 Wheeler Hall, University campus. Dr. Richard Holman will talk on "A Maker of Botanists." The public is invited.
- Sunday, March 18.** Jasper Ridge. Take 8:05 a. m. train to Palo Alto from 3d and Townsend Sts., San Francisco, returning on 4:30 or 6:30 p. m. trains. Leader, Mrs. R. S. Ferris. Walk about 4 miles to ridge. Study of serpentine plants.
- Sunday, April 1.** San Bruno Hills. Meet at entrance of upper waiting room, San Francisco ferry building at 9 a. m. Take Market St. cars, transferring to No. 16 at Third St. Off at Visitacion. Leader, Dr. E. F. Card.
- Thursday, April 12, 8 p. m.** Annual meeting in 212 Wheeler Hall, University campus. Dr. W. W. Robbins will lecture on "Colorado Plant Life—From Plains to Alpine Peaks." Illustrated with slides. The public is invited.
- Sunday, April 15.** Lake San Andreas. Take 8:40 a. m. electric train from Fifth and Market Sts., San Francisco to Millbrae. The Society will dedicate the large Laurel tree in this vicinity. Leader, Professor W. W. Mackie.
- Saturday, April 28.** Mount Diablo. Leave Oakland, 40th and Shafter Sts., via Sacramento Short Line, at 1:30 or 4:30 p. m., Sunday 8:30 a. m., to Diablo station. Take sleeping bag and food for entire trip. Leader, Mr. G. B. Furniss.
- Sunday, May 13.** Lake Chabot. Meet at triangle, Estudillo Ave., San Leandro, 9 a. m. Leader, Miss Anna Ehlers.
- May 27-28.** Annual camping trip to Camp Lonely, Hitchcock Cañon, near St. Helena. Members desiring special circular send name to assistant secretary, Mrs. Adeline Frederick, 1636 Woolsey St., Berkeley.

Verify all train times on latest railway schedules.

Members are privileged to invite guests to lectures and field trips.

MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY



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July, 1923

MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY

The purpose of the Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora, and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographic distribution of the native plants will be especially welcome.

Back Numbers of the Journal may be had from the Assistant Secretary,

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The Society desires botanical books for its library. Pacific Railway Survey, vol. 4, and volumes of the Botanical Gazette will be especially appreciated.



MADROÑO

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ADDITIONS TO THE INTRODUCED FLORA OF CALIFORNIA.

S. B. PARISH

RICHARDIA AFRICANA Spreng. The common Calla Lily has established itself in a marsh on the borders of Bolinas Bay.

CYTISSUS MONSPESSULANUS Linn. Abundant for some distance along both sides of a side road in the hills of Palo Colorado Cañon, Monterey County, June 23, 1921, S. B. Parish 20046. This road passes the entrance to an inhabited clearing in the redwood forest. A shrub 4 to 5 feet high, at the time of collection heavily laden with fruit. A native of Europe.

ALTHEA ROSEA Cav. The Hollyhock is a common weed in gardens and waste places and along waysides at Berkeley. An escape from cultivation. When growing spontaneously it is a short-lived perennial, and the flowers are of shades of rose pink.

SALVIA VERBENACA Linn. Well established in parkings, and escaping into the adjacent hillside, at Scenic and Leroy avenues, Berkeley, May, 1921, S. B. Parish 20069. Also on the University of California campus near the North Gate. A perennial herb, native of Europe.

A NEW SPECIES OF *ERIOGONUM* FROM CALIFORNIA

WILLIS LINN JEPSON

In March, 1922, there was sent me from the upper San Joaquin Valley on the west side by Mr. James M. Perry a portion of a summer or autumn annual that, after drying, had persisted through the winter. As we know little about our spring and summer annuals following the fruiting phase, that is during the period of weathering and disorganization of the plant body in the winter, I took it at first glance to be an unknown or late stage of *Eriogonum angulosum* Bth.

The bractlets, persistent in vertical rows, form a columnar structure about 3 lines high; the flower axillary to the bractlets had fallen but there remained a terminal cluster of about 5 to 8 flowers which possess distinctive characters and set it off from *E. angulosum*.

Eriogonum bidentatum Jepson n. sp. Diffuse annual 5 to 7 inches high; stems repeatedly dichotomous; pedicels 3 to 5 lines long, borne in the forks and terminal, sometimes markedly racemose; bractlets of the involucre spoon-shaped; inner and outer perianth segments very unlike, somewhat unequal, the inner erect, linear-lanceolate, acuminate, arising from a dilated base, the outer spreading a little or approximate about the inner ones; the inner ones rounded-cucullate at the apex with a notch in the hood, each side of the notch ending in a small point; filaments little longer than the ovary.

Collected near Taft by Jas. M. Perry (type). It differs technically

MADROÑO, vol. 1, pp. 115-130, Apr. 30, 1923.

from *Eriogonum angulosum* Bth. in the shape of the perianth segments. In *E. angulosum* the perianth segments are all slightly short-clawed; neither circle is cucullate. In *E. bidentatum* the segments are very narrow but distinctly dilated at the base; the outer segments are markedly hooded and the hood is distinctly two-toothed.

The sender of the material writes: "The plant resembles nothing so much as a lady's veil spread upon the ground, the little seed pods [involucre] representing the dots we see on some of the fabrics. Hence I called it Nun's Veiling."

A CONIFER NEW TO CALIFORNIA

WILLIS LINN JEPSON

While cruising in Shasta County in 1921, W. H. Snell, a cruiser for the Southern Pacific Company, discovered a small area of spruce trees and reported the find to Supervisor Hall of the Shasta National Forest, who in company with Assistant District Forest Woodbury, visited the locality. About fifty trees were found, located in the cañon of the south fork of Clark's Creek, 8 miles northwest of Cayton.

Specimens were sent me by B. C. Goldsmith of the Shasta Forest and I identified them as a form of *Picea Engelmannii* Parry. They differ from the typical form in having glabrous branchlets and frequently one or two resin-ducts in the leaves. A considerable number of the leaves were sectioned under my direction by Miss Elsie Zeile. Cross-sections of some leaves exhibited resin-ducts throughout the length of the leaf, in other leaves only the lower portion showed such structures.

In 1906 I collected this species on Ashland Butte in southern Oregon but it has not hitherto been reported from any station south of that point on the Pacific Coast. It is therefore an addition to the silva of California.

PHYSALIS IXOCARPA BROT.

As I have never found anything like it here before I am sending a plant which may be something rare. Our plant forms were poor this year—all the spring plants being frozen by snow and ice.—JULIA A. BETTYS, southern San Benito Co., July 28, 1922.

This plant is the Tomatillo of the Mexicans and has been introduced into California from the southward, probably from Mexico. It has become frequent in orchards and cultivated fields in coastal Southern California and appears to be spreading slowly but steadily northward. It is often found in flower at all seasons. The following stations may be recorded: Winchester, *Conger*; San Bernardino, *Parish*; Pomona, *Davy* 2857; Ojai Valley, *Olive Thacher*; southern San Benito Co., *Julia A. Bettys*.—W. L. JEPSON.

A REVISION OF CALIFORNIAN UMBELLIFERAE.—II

WILLIS LINN JEPSON

(Continued from page 114)

Locs.—Coast Ranges: Crane Creek, w. Tehama Co., *Jepson*; Buck Mt., Humboldt Co., *Tracy* 3943; Middleton Grade, Mt. St. Helena, *Jepson*; Calistoga, *Jepson*; St. Helena, *Jepson*; Clayton, Contra Costa Co., *Chestnut & Drew*; Mt. Day, *R. J. Smith*; Isabel Creek, Mt. Hamilton Range, *Chandler* 6035. Sierra Nevada: Pine Ridge, Lassen Co., *Baker & Nutting*; Warner Valley, Plumas Co., *Jepson* 4067; Deer Creek Ridge, Nevada Co., *Jepson*; Donner Lake, *Heller* 6928; Blue Cañon, Placer Co., *Harriet Walker* 1300; Armstrong sta., Amador Co., *Hansen* 1117; Gwin Mine, Calaveras Co., *Jepson* 1805; Belle Mdw., Tuolumne Co., *Jepson* 6490; Pine Ridge, Fresno Co., *Hall & Chandler* 183. Southern California: Reche Cañon near Colton, *Parish* (plant 26 inches high); Pasadena, *McClatchie* 3; Foster, San Diego Co., *T. Brandegee* (2 feet high).

Refs.—SANICULA TUBEROSA Torr. Pac. R. R. Rep. 4:91 (1857), type loc. Duffield's Ranch, Confidence, Tuolumne Co., *Bigelow*; *Jepson*, Fl. W. Mid. Cal. 346 (1901); *Wolff* in *Engler*, *Pflzr.* 4²²⁸:78, fig. 16 (1913).

11. **S. saxatilis** Greene. Stems several, branching and widely spreading from the base, 4 to 7 inches long; root a very thick and fleshy tuber, more or less elongated or irregular; ultimate leaf segments broad, coarsely toothed; flowering branches repeatedly dichotomous; flowers straw color; upper tubercles on the fruit tipped with a reduced subulate and somewhat hooked bristle; otherwise like *S. tuberosa*.—Rocky crests, Mt. Diablo.

Loc.—Summit of Mt. Diablo, *Jepson* 9207 (odor very intense and penetrating).

Refs.—SANICULA SAXATILIS Greene, *Erythea* 1:6 (1893), type loc. Mt. Diablo, *Greene*.

3. ANTHRISCUS Bernh.

Annual herb. Leaves bipinnate with bipinnatifid leaflets, the upper leaves reduced. Flowers white. Umbels compound, lateral, shortly peduncled or sessile. Rays few. Involucre none. Involucel of few lanceolate bractlets. Fruit somewhat laterally compressed, ovate, shortly beaked, curved with short hooked bristles. Ribs and oil tubes none or obscure. (Greek anthriscus, its etymology unknown.)

1. **A. vulgaris** (L.) Pers. BUR CHERVIL. Slender, 1½ to 3 feet high; rays 3 to 6, ½ to 1 inch long; pedicels 1 to 3 lines long; fruit 1¾ lines long.—Adventive European weed.

Locs.—St. Helena, *Clara A. Hunt* in 1908; Jolon, *K. Brandegee* in 1909.

Refs.—ANTHRISCUS VULGARIS Pers. *Syn.* 1:320 (1805). *Scandix anthriscus* L. Sp. Pl. 257 (1753), type European. *A. anthriscus* Karst. *Deutsch. Fl.* 857 (1880-83).

4. SCANDIX L.

Annuals with dissected decompound leaves. Flowers white, polygamous, in compound umbels. Staminate flowers with stamens and green disk, and occasionally with short styles; pistillate flowers with long styles, purple disk and with or without stamens. Rays commonly 2, rarely 1 or 3. Involucre none or of one bract. Involucels of several bractlets. Petals unequal, the outer larger. Fruit linear, flattened laterally, muriculate, prolonged into a beak several times longer than the body. Ribs prominent. Oil-tubes none. Seed-face sulcate. (The Greek name.)

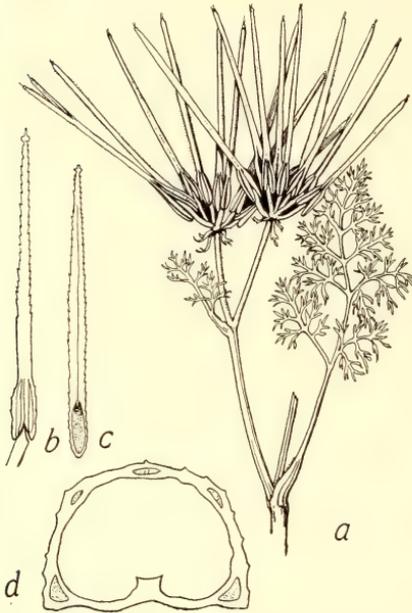
1. **S. pecten-veneris** L. SHEPHERD'S NEEDLE. Fig. 9. Erect, simple or branching, 5 to 16 inches high, somewhat hispidulous; leaves 2 or 3 times pinnately dissected into linear acute segments less than ½ line wide; bractlets 2 or 3-toothed at apex or entire; rays ½ to 1 inch long; pedicels very short; body of fruit 4 lines long, bearing a straight flattish beak 1¾ inches long, its edges hispidulous.—San Francisco Bay region; naturalized from Europe.

Locs.—St. Helena, *Eastwood* in 1900; Santa Rosa, *Eastwood* in 1893; Napa Junction, *Jepson* 9625 in 1922; Olema, *Jepson* in 1910, Berkeley, *Jepson* in 1891.

Refs.—SCANDIX PECTEN-VENERIS L. Sp. Pl. 256 (1753), type European; *Jepson*, Fl. W. Mid. Cal. 346 (1901).

5. OSMORRHIZA Raf. SWEET CICELY

Perennials with thick aromatic roots. Leaves mostly basal, 2 to 3 times, ternately compound. Flowers white, in compound umbels. Calyx teeth obsolete.



9. *Scandix pecten-veneris* L.; a, fr. branchlet x $\frac{1}{2}$; b, fr. x $\frac{1}{2}$; c, carpel x $\frac{1}{2}$; d, sect. carp. x 10.

7 to 9 lines long, the ribs armed with bristles pointed upward; seed-face deeply concave or even involute.—Sierra Nevada, 3000 to 5000 feet, from Sierra Co. to Tulare Co.; South Coast Ranges from Santa Clara Co. to Santa Barbara Co.; cismontane Southern California.

Locs.—Sierra Nevada: Downieville (Pac. R. Rep. 4⁵:93); Hetch-Hetchy, *Hall & Babcock* 3379; Hazel Green, Yosemite Park, *Jepson*; Huntington Lake, Fresno Co., *A. L. Grant* 1173; Tehipite Valley, *Hall & Chandler* 473; Cedar Creek, North Fork Kaweah River, *Jepson* 607; Bear Creek, North Fork Tule River, *T. Brandegee*. Southern California: Cuyamaca, *Abrams* 3838; Witch Creek, *Alderson*; Palomar, *Jepson* 1527; Mill Creek Cañon, San Bernardino Mts., *Jepson* 5572; Millards Cañon, San Gabriel Mts., *Peirson* 135; Ojai Valley, *Hall* 3245. South Coast Ranges: Ft. Tejon, *Davy* 2337; Santa Ynez Mts., *Dunn*; betw. King City and Jolon, *Eastwood*; upper Nacimiento River, *Jepson* 1693; Big Sur, Santa Lucia Mts., *Davy* 7432; Alum Rock, Mt. Hamilton Range, *Pendleton* 668.

Refs.—OSMORRHIZA BRACHYPODA Torr.; Dur. Jour. Acad. Phil, ser. 2, 3:89 (1855), type loc. Deer Creek near Nevada City, *Pratten*; *Jepson*, Fl. W. Mid. Cal. 347 (1901). *Washingtonia brachypoda* Heller, Cat. N. Am. Pl. 5 (1898); C. & R. Contrib. U. S. Nat. Herb. 7:63, fig. 7 (1900).

2. *O. nuda* Torr. Fig. 10. Stem glabrous, $1\frac{1}{2}$ to $2\frac{1}{2}$ feet high or less; leaves 5 to 11 inches long, the cauline much reduced; petioles with short stiff spreading hairs, the leaflets more or less hispidulous; leaflets ovate or elliptical, 3-lobed or -cleft and serrate, often narrowly or broadly cuneate at the entire base, $\frac{1}{2}$ to $2\frac{1}{2}$

Involucre reduced or obsolete. Involucels present or none. Fruit linear or linear-oblong, rather prominently attenuate at base, glabrous and smooth or bristly along the ribs; carpels pentagonal in cross section, with equal ribs. Oil-tubes none in mature fruit. Seed-face concave to very deeply sulcate. (Greek osme, odor, and rhiza, root.)

Fruit with bristly ribs; carpel long-attenuate at base (except No. 1).

Involucels of several bractlets..... 1. *O. brachypoda*.

Involucels none.

Fruit beaked or constricted at apex..... 2. *O. nuda*.

Fruit obtuse at apex..... 3. *O. obtusa*.

Fruit ribs not bristly; carpel not attenuate (mostly obtuse) at base.

Fruiting rays usually erect, forming a compact cluster of fruits; leaflets oblong-lanceolate..... 4. *O. occidentalis*.

Fruiting rays spreading, forming a loose umbel; leaflets ovate..... 5. *O. bolanderi*.

1. *O. brachypoda* Torr. Erect, $1\frac{1}{2}$ to $1\frac{3}{4}$ feet high, glabrous or strigosely puberulent; leaflets coarsely lacinate-cleft and serrate, mucronulate, $\frac{3}{4}$ to 2 inches long; umbel 1 to 5-rayed, the fruiting rays 2 to 4 inches long; pedicels 1 line long; involucre mostly absent; involucels of linear acuminate bractlets; fruit

inches long; rays 3 or 4 (to 6), 2 to 4 inches long; pedicels 3 to 8 lines long; involucls none; fruit 5 to 8 lines long, attenuate into a slender base $\frac{1}{4}$ to $\frac{1}{2}$ as long as the body, and at apex more or less contracted into a beak $\frac{1}{2}$ to 1 line long; attenuate base of fruit very bristly, the body upwardly bristly on the ribs; seed-face sulcate.—Shady woods: cismontane Southern California; Coast Ranges mostly near the coast, 100 to 2000 ft.; Sierra Nevada, 4000 to 6000 ft., from Tulare Co. to Placer Co. The most common species.

Locs.—Southern California: Stonewall Mine, Cuyamaca Mts., *Parish* 4421; San Bernardino Mts. (Pl. World, 20:247); San Antonio Mts. (Pl. World, 22:111). Coast Ranges: Big Creek, Santa Lucia Mts., *K. Brandegee*; Santa Cruz Mts., *Jepson*; Mt. Diablo, *Jepson*; Mt. Tamalpais, *Jepson* (pedicels 5 to 11 lines long); St. Helena, *Jepson*; Napa Co., *John Benson*; Comptche, *Harriet Walker* 369; Eureka, *Tracy* 2464; mouth of Willow Creek, Trinity River, *Tracy* 3322; Quartz Valley, Siskiyou Co., *Butler* 1453. Sierra Nevada: Old Colony Mill, Sequoia Park, *Jepson* 637; Pine Ridge, Fresno Co., *Hall & Chandler* 331; Yosemite, *Hall* 9223; Calaveras Big Trees, *A. L. Grant*; Eagle Mdws., Tuolumne Co., *A. L. Grant* 373; Silver Creek, El Dorado Co., *Kennedy* 56; Blue Lake, Warner Mts., *L. S. Smith* 1003.

Var. *BRÉVIPES* *Jepson* n. comb. Leaflets puberulent or strigose; pedicels $1\frac{1}{2}$ to 3 lines long.—Tuolumne Co. to Siskiyou Co. Scarcely more than a formal variety.

Locs.—Confidence, Tuolumne Co., *Jepson* 7708; Plumas Co., *Cleveland*; Bear Valley, Nevada Co., *Jepson*; Sisson, *Jepson*.

Var. *DIVARICATA* *Jepson* n. comb. Nearly glabrous, but variable in this respect and scarcely of varietal rank.—Placer Co. to Tehama Co. and northward.

Locs.—Tallac, *Jepson* 8087; Morgan, Tehama Co., *Hall & Babcock* 4408b.

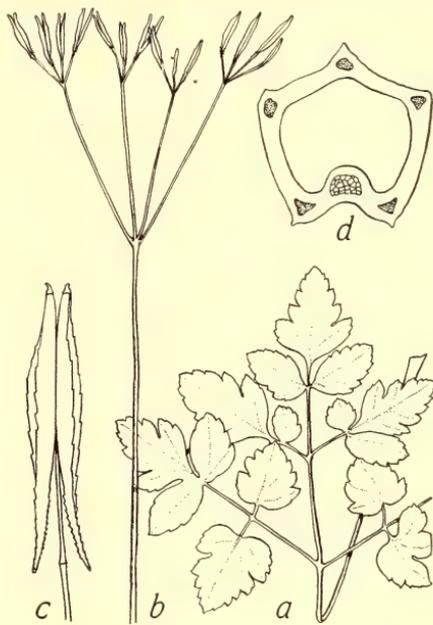
Refs.—*OSMORRHIZA NUDA* Torr. Pac. R. Rep. 4^s:93 (1857), type loc. Napa Valley, *Bigelow*; *Jepson*, Fl. W. Mid. Cal. 347 (1901). *Washingtonia nuda* Heller, Cat. N. Am. Pl. 5 (1898). *Urospermum nudum* Ktze., Rev. Gen. Pl. 1:270 (1891). *Myrrhis nuda* Greene, Man. Bay Reg. 157 (1894). Var. *BREVIPES* *Jepson*. *O. brevipes* *Jepson* in herb. *Washingtonia brevipes* C. & R. Contrib. U. S. Nat. Herb. 7:66 (1900), type loc. Mt. Shasta and vicinity, *Palmer* 2481. Var. *DIVARICATA* *Jepson*. *Washingtonia divaricata*, Britt. Ill. Fl. 2:531 (1897), type from Ore., *Nuttall*.

3. *O. obtusa* Fer. Resembles *O. nuda*, but more slender, 1 to $1\frac{1}{2}$ feet. high; herbage almost glabrous; rays widely spreading or the lateral deflexed; fruiting pedicels 2 to 4, divaricate, 6 to 8 lines long; fruit 5 to $7\frac{1}{2}$ lines long, obtuse or slightly pointed at the tip, less bristly.—Northern Sierra Nevada; east to the Rocky Mts. and north to British Columbia.

Loc.—Sierra Co. acc. *Coulter & Rose*.

Refs.—*OSMORRHIZA OBTUSA* Fer., Rhod. 4:154 (1902). *Washingtonia obtusa* C. & R. Contrib. U. S. Nat. Herb. 7:64 (1900), type loc. Ishawood Creek, Wyo., *Rose* 476.

4. *O. occidentalis* Torr. SIERRA SWEET CICELY. Plants 2 to $3\frac{1}{2}$ feet high;



10. *Osmorrhiza nuda* Torr.; a, leaf x $\frac{1}{3}$; b, umbel x $\frac{1}{3}$; c, fr. x $2\frac{1}{2}$; d, sect. carp. x 18.

herbage minutely puberulent or nearly glabrous; leaflets oblong-lanceolate (or rarely ovate), serrate or sparingly incised, 1 to $1\frac{1}{2}$ (or $2\frac{1}{2}$) inches long, some of them obliquely lobed on one side by a deep incision toward the base; rays 5 to 12, in fruit erect (1 to $2\frac{1}{4}$ inches long) and forming a close or compact umbel; pedicels $1\frac{1}{2}$ to 4 lines long; bracts 1 or 2 or none; stylopodium conical, about equalling the style; fruit 6 to 7 lines long, acutish at apex or obscurely short-beaked, with prominent acute not bristly ribs; seed-face very concave.—Sierra Nevada, 4000 to 8500 feet, from Madera Co. to Siskiyou Co., thence southerly to Mendocino Co. North to Alberta.

Locs.—Potter Valley, *Purpus*; Buck Mt., Humboldt Co., *Tracy* 4238; Shackelford Creek, w. Siskiyou Co., *Butler* 1668; Dorleska, Salmon Mts., *Hall* 8665; Eagle Peak, Warner Mts., *Jepson* 7960; Morgan, Tehama Co., *Hall & Babcock* 4408a; Webber Lake, *S. B. Doten*; Summit, Nevada Co., *Jepson*; Pyramid Peak, *Hall & Chandler* 4757; Silver Creek, El Dorado Co., *Kennedy* 72; Kennedy Lake, Tuolumne Co., *A. L. Grant* 202; Rancheria Mt., *Jepson* 4592; Bloody Cañon, Mono Co., *Chestnut & Drew*; San Joaquin Pass, Madera Co., *Congdon*.

Refs.—OSMORRHIZA OCCIDENTALIS (Nutt.) Torr. Bot. Mex. Bound. 71 (1859); *Jepson*, Fl. W. Mid. Cal. 347 (1901). *Glycosma occidentalis* Nutt. T. & G. Fl. 1:639 (1840), type loc. Blue Mts., Ore., *Nuttall*. *Myrrhis occidentalis* B. & H. Gen. Pl. 1:897 (1867). *Washingtonia occidentalis* C. & R. Contrib. U. S. Nat. Herb. 7:67 (1900).

This species probably includes *O. ambigua* C. & R. Rev. N. Am. Umbell. 119,—1888 (*Glycosma ambiguum* Gray, Proc. Am. Acad. 8:386,—1872, type loc. foot of Cascade Mts., Ore., *Hall*; *Myrrhis ambigua* Greene, Fl. Fr. 332,—1892). The fruits on plants from the Cascade Mts., Wash. (Goat Mt., *Allen* 256, rays spreading; Mt. Adams, *Suksdorf*, rays erect) do not differ from those of the Californian *O. occidentalis*, while the herbage in these spms. is scarcely more glabrous than in *Butler* 1668 (Shackelford Creek, Siskiyou Co.) or *Hall* 8665 (Salmon Mts.).

5. ***O. boländeri*** (Gray) *Jepson* n. comb. Stems stout, 3 feet high; herbage more or less puberulent, somewhat more pubescent at the nodes; leaflets broadly ovate, coarsely toothed, 1 to 2 inches long; fruiting rays spreading, $1\frac{1}{2}$ to 3 inches long; fruit 8 to $9\frac{1}{2}$ lines long, with a stout short beak; stylopodium flat, shorter than the style; seed-face deeply sulcate.—Mendocino Co. to Siskiyou Co.

Locs.—Cahto, acc. *Coulter & Rose*; Long Gulch near Yreka, *Butler* 455. Apparently includes also Lost Lake trail, Warner Mts., *L. S. Smith* 8019.

Refs.—OSMORRHIZA BOLANDERI *Jepson*. *Myrrhis boländeri* Gray, Proc. Am. Acad. 7:346 (1868), type loc. Lambert Lake, Mendocino Co., *Bolander*. *Osmorrhiza occidentalis* var. *boländeri* C. & R. Rev. N. A. Umbell. 119 (1888). *Washingtonia boländeri* C. & R. Contrib. U. S. Nat. Herb. 7:68 (1900).

6. DAUCUS L.

Bristly or hispid annuals or biennials with dissected decomposed leaves and white flowers. Umbels compound, concave, surrounded by cleft bracts and borne on long peduncles. Involucels of entire or toothed bractlets. Calyx-teeth obsolete. Fruit somewhat flattened dorsally. Primary ribs slender, bristly; secondary ribs with a single row of prominent barbed prickles. Oil-tubes as in *Caucalis*. (*Daukos*, the Greek name.)

Involucre divided into short linear or lanceolate segments; rays mostly 2 to 6 lines long.

Involucre divided into elongated filiform segments; rays 1 to $2\frac{1}{2}$ in long. 1. *D. pusillus*.

2. *D. carota*.

1. ***D. pusillus*** Michx. RATTLESNAKE WEED. Plants 4 to 7 (or 22) inches high; stems and peduncles retrorsely hispid; leaves finely dissected into linear segments; rays mostly 2 to 6 lines long, sometimes as much as 1 or $1\frac{1}{2}$ inches long, somewhat unequal; pedicels very unequal, commonly 1 or 2 lines long or almost wanting; fruit $1\frac{1}{2}$ to 2 lines long.—Throughout cismontane California in the hill country. Eastward to the Carolinas and north to British Columbia. Apr. The herbage is in rural repute as an antidote for the bite of the rattlesnake, whence "Yerba del Vibora" of the Spanish-Californians.

Locs.—Mariposa Co. foothills (*Zoe* 3:29); Amador region, acc. *Hansen*; Marys-

ville Buttes, *Copeland* 3354; Martins Ranch, South Fork Trinity River, *Jepson* 2021; Redwood Creek, Humboldt Co., *Jepson* 1963; mouth of Little River, *Tracy* 2579; Comptche, *Harriet Walker*; San Francisco, *Greene*; Arroyo Grande, *Alice King*; Estrella plain, *Barber*; Ojai Valley, *F. W. Hubby*; North Pomona, *Braunton* 245; San Jacinto River Cañon, *Hall* 1818.

Refs.—*DAUCUS PUSILLUS* Michx. Fl. Bor. Am. 1:164 (1803), type from the Carolinas; C. & R. Contrib. U. S. Nat. Herb. 7:249, fig. 65 (1900); *Jepson*, Fl. W. Mid. Cal. 347 (1901).

2. *D. caròta* L. CARROT. Biennial; stems erect, branching, hispid, 2 to 3 feet high; root fleshy, conical; leaves many times dissected into small linear or lanceolate segments; segments of the involucre linear-lanceolate or subulate; rays numerous, 1 to 2 inches long in fruit; umbels in fruit concave and like a bird's nest; fruit 2 lines long.—European cultivated plant, an escape from gardens, locally naturalized in valley lands.

Locs.—Alameda, *Jepson*; Alvarado, *Jepson*; Monterey, *Jepson*; Los Angeles (*Erythra* 1:59); Rivera, *Braunton* 284; Claremont, *Chandler*; San Bernardino (*Zoe* 1:27).

Refs.—*DAUCUS CAROTA* L. Sp. Pl. 242 (1753), type European; *Jepson*, Fl. W. Mid. Cal. 348 (1901).

7. TÓRILIS L.

Erect slender annuals with hispidulose herbage, bipinnate leaves and white flowers in subcapitate umbels. Involucre and involucels of linear bracts. Fruit with the secondary ribs more prominent than the primary and bearing a row of bristles or tubercles; bristles rough, hooked at tip. Oil-tubes solitary, 2 on the commissure. (Derivation unknown.)

1. *T. nodòsa* (L.) Gaertn. KNOTTED HEDGE PARSLEY. Erect, 7 to 13 inches high, the stems with few branches, retrorsely scabrous; leaves pinnate (lower 3 to 5 inches long including petiole, the upper successively shorter); leaflets bipinnately dissected; umbels scattered along the stems opposite the leaves, on very short peduncles (1 or 2 lines long), simple or with a supplementary short proliferous umbel; fruits $1\frac{1}{2}$ to 2 lines long, those on the outside of the umbel with the exterior carpel densely covered with hooked bristles, the inner carpels as well as the inner fruits warty and without prickles.—Native of Europe, naturalized in California, now widely spread and locally common on openly wooded hills.

Locs.—Oak Run, Shasta Co., *Baker & Nutting* in 1894; Little Chico Creek, *R. M. Austin* in 1883; College City, *Alice King* in 1905; Vacaville, *Jepson* in 1891; French Camp, *Sanford* in 1890-91; Auburn, *Shockley* in 1886; Ione, *Braunton* in 1904; Gwin Mine, Calaveras Co., *Jepson* 1817 in 1902; Columbia, *Jepson* 6350 in 1915; Pine Log, Tuolumne Co., *A. L. Grant* 705 in 1916; Sausalito, *Bioletti* in 1891; Berkeley, *H. A. Walker* in 1907; Arroyo Grande, *Alice King* in 1895; Mt. Firmin near San Pedro, *A. Davidson* in 1914.

Refs.—*TORILIS NODOSA* Gaertn. Fruct. 1:82, t. 20, f. 6 (1788). *Tordylium nodosum* L. Sp. Pl. 240 (1753), France, Italy. *Caucalis nodosa* Huds. Fl. Angl. ed. 2, 114 (1778); *Jepson*, Fl. W. Mid. Cal. 348 (1901).

8. CAÚCALIS L.

Annuals with decompound leaves dissected into small segments. Flowers white. Umbels more or less irregularly compound. Calyx-teeth prominent. Fruit flattened laterally. Primary ribs 5, filiform, bristly; secondary ribs 4, prominent, winged, bearing barbed or hooked prickles. Oil-tubes solitary in the intervals, *i.e.*, under the secondary ribs, 2 on the face. (Kaukalis, the Greek name.)

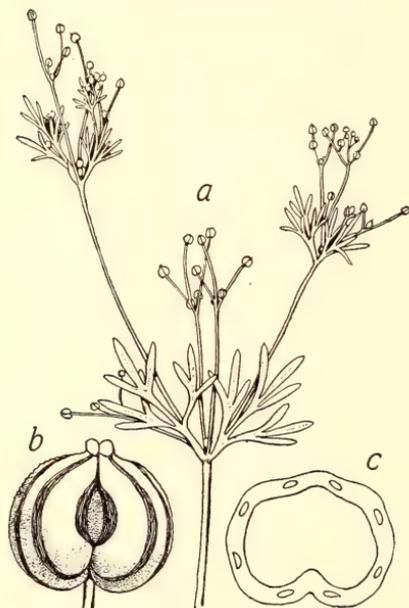
1. *C. microcárpa* H. & A. Fig. 11. Erect, slender, 6 to 12 inches high; leaves 2 or 3 times ternate and much dissected, slightly hispid; umbels unequally 3 to 5-rayed; rays 1 to $3\frac{3}{4}$ inches long; pedicels 8 lines long or less; involucre of foliaceous dissected bracts; involucels of entire or somewhat divided bractlets; fruit oblong, 2 lines long, armed with rows of hooked prickles.—Coast Ranges and Sierra Nevada, widely distributed but not common. North to Washington, and south to Arizona and Mexico.

Locs.—San Diego, *Dunn*; Fallbrook, *Abrams* 3318; Reche Cañon near Colton, *Parish*; Menifee, Riverside Co., *Alice King*; Eaton Cañon, San Gabriel Mts., *Peirson* 132; Ft. Tejon, *Davy* 2372; Arroyo Grande, *Alice King*; New Idria, *Brewer* 801; Los Gatos, *Heller* 7469; Vaca Mts., *Jepson*; Scotts Valley, Lake Co., *Tracy* 1705; Round Valley, Mendocino Co., *Bolander* 4699; Humboldt Bay, *Tracy* 2454; Hupa, *Chandler* 1315; Crane Creek, w. Tehama Co., *Jepson*; Morley's sta., Shasta Co., *M. S. Baker*; Little Chico Creek, *R. M. Austin*; Limekiln Creek, Tulare Co., *Jepson* 2801.

Refs.—CAUCALIS MICROCARPA H. & A. Bot. Beech. 348 (1840), type from Cal., *Douglas*; *Jepson*, Fl. W. Mid. Cal. 348 (1901); C. & R. Contrib. U. S. Nat. Herb. 7:70, fig. 8, (1900).

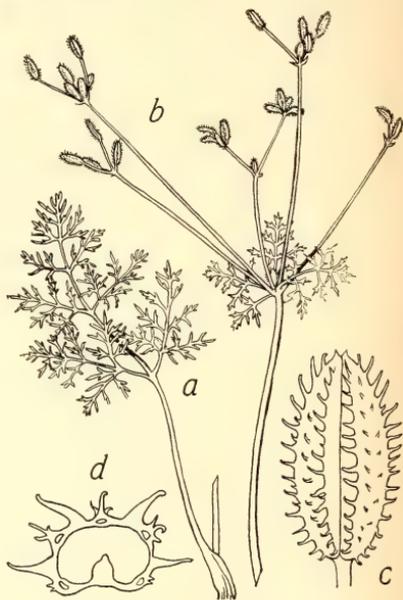
9. APIÁSTRUM Nutt.

Small branching glabrous annual with dissected leaves. Flowers small, white, in irregularly compound umbels. Rays and pedicels unequal. Involucre



12. *Apiastrum angustifolium* Nutt.; *a*, umbels x 1; *b*, fr. x 10; *c*, sect. carp. x 10.

papillate-roughened all over; ribs inconspicuous.—Dry mountain slopes or sandy valleys: Coast Ranges, Sierra Nevada and cismontane Southern California. Lower California. Apr.-May.



11. *Caulalis microcarpa* H. & A.; *a*, leaf x $\frac{1}{2}$; *b*, umbel x $\frac{1}{2}$; *c*, fr. x 4; *d*, sect. carp. x 7.

and involucrels none. Calyx-teeth wanting. Fruit somewhat laterally compressed, elliptic-cordate, more or less tuberculate. Oil-tubes solitary in the intervals, 2 on the commissure. Seed-face narrowly concave. (*Apium*, celery, and aster, Latin suffix meaning wild.)

1. *A. angustifolium* Nutt. Fig. 12. Erect, di- or trichotomously branched from the base, 4 to 8 (or 15) inches high; leaves opposite below, twice or thrice ternately dissected into linear segments $\frac{1}{2}$ to 1 inch long; umbels sessile in the forks or opposite the upper leaves, consisting of 2 or 3 umbellets borne on unequal rays (1 inch long or less), and of 1 or 2 usually sessile or sometimes pedicelled flowers in the center; umbellets 3 or 4-flowered, the pedicels unequal ($4\frac{1}{2}$ lines long or less) or 1 flower sessile; fruit cordate, broader than high, less than 1 line long,

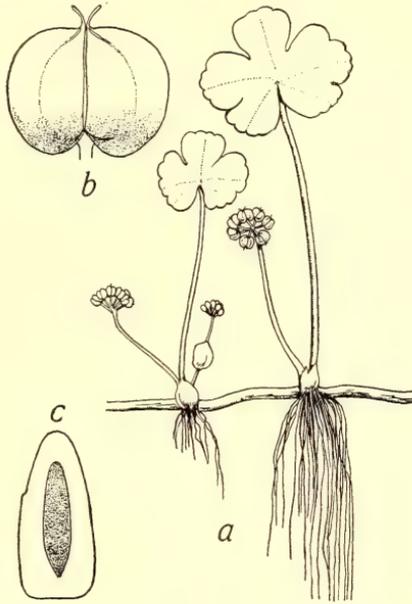
Locs.—Coast Ranges: Hough's Sprs., n. Lake Co., *Jepson* 9020; Vaca Mts., *Jepson*; Conn Valley, Napa Range, *Jepson*; Mt. Diablo, *Rattan*; Mt. Tamalpais, *K. Brandegee*; Eva sta., Santa Cruz Mts., *Jepson*; Milpitas Ranch, Santa Lucia Mts., *Eastwood*; Alcalde, *Eastwood*. Sierra Nevada: Folsom, *K. Brandegee*; Comanche, Amador Co., *Hansen*; betw. Valley Sprs. and Mokelumne Hill, *F. E. Blaisdell*. Southern California: Henniger's Flats, San Gabriel Mts., *Peirson* 133; Garvanza, *Braunton*; San Bernardino, *Parish*; Catalina Isl., *Gambel*; Pala, *Jepson* 8497.

Refs.—APIASTRUM ANGUSTIFOLIUM Nutt. T. & G. Fl. 1:644 (1840), type loc. San Diego, *Nuttall*; *Jepson*, Fl. W. Mid. Cal. 349 (1901).

10. HYDROCOTYLE L.

Perennial glabrous herbs, the peduncles and leaves from creeping stems or rootstocks. Leaves simple, round in outline, long-petioled. Flowers in a small simple umbel, or disposed in 2 or more umbels which are proliferous one above the other. Fruit flattened laterally, suborbicular, the dorsal rib prominently margined and with one or 2 filiform ribs on each side. Oil-tubes none. (Greek hudor, water, and cotule, a low vessel, the peltate leaves of some species being saucer-shaped.)

- Leaves not peltate, 5 or 6-cleft; umbels simple.....1. *H. ranunculoides*.
 Leaves peltate, more or less crenate.
 Umbels simple, fruit notched at base and apex...2. *H. umbellata*.
 Umbels proliferous, forming an interrupted spike.
 Fruit not notched at base, sessile or on very short pedicels...
3. *H. verticillata*.
 Fruit notched at base, the pedicels $1\frac{1}{2}$ to 7 lines long.....
4. *H. prolifera*.



13. *Hydrocotyle ranunculoides* L. f.; a, habit x $\frac{1}{2}$; b, fr. x 6; c, sect. carp. x 12.

1. *H. ranunculoides* L. f.

WATER PENNYWORT. Fig. 13.

Stems floating or creeping in mud, rooting at the nodes; leaves orbicular, ($\frac{3}{4}$ or 1 to $1\frac{3}{4}$ inches broad, 5 or 6-cleft, the lobes crenulate; petioles 3 to 5 (or 9) inches long; peduncles $\frac{1}{2}$ to $2\frac{1}{2}$ inches long, reflexed in fruit; pedicels $\frac{1}{2}$ line long; fruit ovoid, 1 line broad; ribs obscure.—Pools or muddy shores, often floating in rather deep water: South Coast Ranges to Southern California; thence east to the Atlantic.

Locs.—Butano Creek, San Mateo Co., *Jepson* 4161; Milpitas, *R. J. Smith*; San Jose, *Jepson*; Moss Ldg., Monterey Co., *Abrams* 4056; Victorville, *Jepson* 5608; Thomas Valley, San Jacinto Mts., *Hall* 2168; Warner Ranch, San Diego Co., *T. Brandegee*.

Refs.—HYDROCOTYLE RANUNCULOIDES L. f. Suppl. 177 (1781), type loc. Mexico; *Jepson*, Fl. W. Mid. Cal. 342 (1901). *H. natans* Cyr. Pl. Rar. Neap. 1:20, pl. 605 (1892).

2. *H. umbellata* L. Petioles and peduncles subequal, $1\frac{1}{2}$ to 4 (or 6) inches high, arising from slender creeping rootstocks with descending branches bearing round tubers; leaves orbicular-peltate, crenate, 4 to 7 (or 14) lines broad; umbels many-flowered, simple (rarely slightly proliferous); bracts of involucre short, ovate; pedicels $1\frac{3}{4}$ to 6 lines long; fruit $\frac{3}{4}$ to 1 line long, strongly notched at base

and apex; dorsal rib prominent but obtuse.—Southern California. Southward into Mexico, eastward to the Atlantic.

Locs.—Los Angeles River, *Braunton* 533; Buena Park, Orange Co., *C. W. Hamlin*; San Bernardino, *Parish* 920, 6463; Rancho Verde, sw. Mohave Desert, *Parish* 9704.

Refs.—HYDROCOTYLE UMBELLATA L. Sp. Pl. 234 (1753), type North America.

3. *H. vérticillata* Thunb. Similar in habit to *H. umbellata*; umbels forming an interrupted spike of 3 to 5 whorls; fruit shortly pediceled or sessile.—Southwest Colorado Desert (C. R. Orcutt). East to the Atlantic.

Var. *CUNEATA* Jepson n. comb. Fruits abruptly short-acute at base.—Southern California to the Great Valley: Jamul, San Diego Co., *Orcutt*; Santa Barbara (acc. Coulter & Rose); Suisun Marshes, *Jepson*.

Refs.—HYDROCOTYLE VERTICILLATA Thunb. Diss. 2:415, pl. 3 (1800). Var. *CUNEATA* Jepson. *H. cuneata* C. & R. Contrib. U. S. Nat. Herb. 7:28, fig. 1 (1900), type loc. Montezuma Well, Ariz., *McDougall* 575; *Jepson*, Fl. W. Mid. Cal. 288 (1911).

4. *H. prolifera* Kell. MARSH PENNYWORT. Peduncles and petioles subequal, 6 to 12 inches high; descending branches of the rootstock tuberous-enlarged; leaves orbicular-peltate, emarginate at base, slightly crenate, $1\frac{1}{4}$ to $1\frac{3}{4}$ inches broad; umbels proliferous, one above the other in 2 to 4 whorls; pedicels 1 to 3 lines long; mature fruit 1 line long and slightly broader, slightly notched at base and apex.—Marshes of the lower Sacramento and San Joaquin rivers, thence west to San Francisco and Sonoma counties. Possibly represented in Arizona.

Locs.—Bouldin Isl. (*Zoe*, 4:214); Santa Rosa, *M. S. Baker*.

Refs.—HYDROCOTYLE PROLIFERA Kellogg, Proc. Cal. Acad. 1:15 (1854); type loc. about San Francisco, *Kellogg*; *Jepson*, Fl. W. Mid. Cal. ed. 2:288 (1911).

11. BOWLESIA R. & P.

Delicate annuals with stellate pubescence, opposite simple leaves and scarious lacerate stipules. Umbels simple, few-flowered, on short axillary peduncles. Flowers white, minute. Calyx-teeth prominent. Fruit ovate, somewhat flattened laterally, with narrow commissure; carpels turgid, becoming depressed on the back. Ribs and oil-tubes none. (Wm. Bowles, 1705-1780, Irish naturalist and traveler.)

1. *B. lobata* R. & P. Stems mostly branching at the base, weak and trailing, $\frac{1}{2}$ to 2 feet long, flowering from the base; leaves thir, mostly 5-lobed, broader than long, usually heart-shaped at base, the lobes entire or some of them 1 or 2-toothed, $\frac{1}{2}$ to 1 inch broad; petioles 1 to 3 inches long or the upper shorter; umbels 1 to 4-flowered; fruit 1 line long.—Shaded places in the hills: Coast Ranges; Sierra Nevada; Southern California. Eastward to Texas.

Locs.—Coast Ranges: San Leandro Creek, Alameda Co., *Kellogg*; Potrero Hills, San Francisco, *Kellogg*; Pacific Grove, *Heller* 6498. Sierra Nevada: betw. Mokelumne Hill and San Andreas, *F. E. Blaisdell*; Kaweah, *Hopping* 544. Southern California: Ojai Valley, *F. W. Hubby*; Playa del Rey, Los Angeles Co., *Braunton* 827; Santa Paula, *Benj. Cobb*; San Bernardino, *Parish*; Witch Creek, *Alderson*.

Refs.—BOWLESIA LOBATA R. & P. Prod. 44:t. 34 (1794); Fl. Peruv. 3:28 (1802); *Jepson*, Fl. W. Mid. Cal. 342 (1901). *B. septentrionalis* C. & R. Contrib. U. S. Nat. Herb. 7:31, fig. 3 (1900), type loc. near Tucson, Ariz., *Myrtle Zuck*.

12. CONIUM L.

Tall branching biennial with dissected decomposed leaves. Flowers white, in compound umbels. Involucre and involuclers small. Calyx-teeth obsolete. Fruit broadly ovate, somewhat laterally flattened. Ribs prominent. Oil-tubes none. (Greek name of the Hemlock.)

1. **C. maculatum** L. POISON HEMLOCK. Fig. 14. Tall (4 to 10 feet high), the stem dotted with purple marks; herbage with a mouse-like odor; leaves 1 to 2 feet long or more, the segments incised or pinnatifid; rays 10 to 16, $\frac{3}{4}$ to $1\frac{1}{4}$ inches long; bractlets ovate-lanceolate, commonly 3; fruit $1\frac{1}{2}$ lines long, shorter than the pedicels.—Native of Europe, naturalized in shady or moist ground. Widely distributed. A poisonous plant, all parts toxic, although preparations from the leaves are sometimes inert.

Locs.—Mokelumne Hill. *F. E. Blaisdell*; Truckee, *Sonne* in 1892; Yreka, *Butler* 924 in 1909; Falks Mill, South Fork Elk River, *Tracy* 4496 in 1914; Drake Bay, teste *Jepson* in 1900; Mormon Isl., *T. Brandegeé* in 1884; Lake Merced, San Francisco, *Eastwood* in 1895; Alviso, *Jepson* 9318 in 1921; Arroyo Grande, *Alice King*; San Bernardino, *Parish* 12,001.

Refs.—**CONIUM MACULATUM** L. Sp. Pl. 243 (1753), type European; *Jepson*, Fl. W. Mid. Cal. 349 (1901).

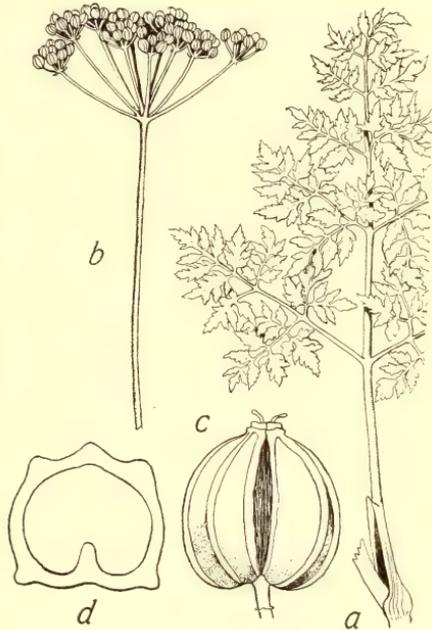
13. CORIANDRUM L.

Slender, glabrous, strong-smelling annual with leafy stems. Lower leaves pinnate or bipinnate with broad leaflets; upper leaves finely dissected. Flowers white or rose-tinted, the petals conspicuously unequal. Umbels compound. Involucre none. Involucels of few narrow bractlets. Fruit subglobose, not constricted at the commissure; calyx-teeth conspicuous; ribs filiform or acutish; oil-tubes solitary in the intervals, a few on the commissure. (Ancient Latin name.)

1. **C. sativum** L. CORIANDER. One to $2\frac{1}{2}$ feet high; leaflets of lower leaves roundish or ovate, cleft and toothed, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; divisions of upper leaves linear, 2 to 4 lines long; fruit $1\frac{3}{4}$ lines long.—Garden plant from Southern Europe, occasionally escaped from cultivation.

Locs.—San Diego (C. & R. Rev. N. Am. Umbell. 35); Anaheim, *Alice King* in 1908; Los Angeles (*Erythea* 1:59); Truckee, *C. F. Sonne*.

Refs.—**CORIANDRUM SATIVUM** L. Sp. Pl. 1:256 (1753), type Italian.



14. *Conium maculatum* L.; a, leaf x $\frac{1}{2}$; b, umbel x $\frac{1}{2}$; c, fr. x 6; d, sect. carp. x 10.

14. APIUM L.

Ours erect glabrous biennials with fibrous roots and pinnate leaves. Stems tri- or di-chotomously branched, forming a paniculate inflorescence, the compound umbels opposite the leaves, terminal on the branches or subsessile in the forks. Involucre and involucels small or none, or the former sometimes foliaceous. Flowers white. Calyx-teeth obsolete. Fruit elliptic-ovate or broader than long. Ribs prominent, obtuse, equal. Oil-tubes solitary in the intervals, 2 on the commissure. Seed-face plain. (Old Latin name of Celery.)

1. **A. graveolens** L. COMMON CELERY. Stems 2 to 4 feet high; lower leaves long-petioled, the leaflets 5 (or 7 or 9), 1 to 3 inches long and as broad or broader, coarsely toothed and 3-cleft or even -divided; upper leaves on short petioles or

sessile, the leaflets 3; rays 4 to 12 lines long; fruit $\frac{1}{2}$ to $\frac{3}{4}$ line long.—European garden plant; naturalized in marshes or along streams from Southern California to the Sacramento Valley. July-Aug.

Locs.—Ramona, *T. Brandegee*; Riverside, *Hall*; San Bernardino, *Parish*; Claremont, *Chandler*; Carmel River, *Jepson*; Los Angeles (*Erythraea* 1:59); South Berkeley, *Davy*; Suisun Marshes, *Jepson*.

Refs.—*APIUM GRAVEOLENS* L. Sp. Pl. 264 (1753), type European; Parish, *Zoe*, 1:9 (1890); *Jepson*, Fl. W. Mid. Cal. 350 (1901).

APIUM AMMI Urban, Fl. Bras. 11:341, pl. 91 (1879); C. & R. Contrib. U. S. Nat. Herb. 7:86, fig. 19 (1900); *Sison ammi* L. Sp. Pl. 252 (1753), type loc. Apulia, Egypt. Leaves ternate, the segments filiform; umbels sessile.—The only record for this is "California, Douglas, 1833," by Coulter & Rose, l. c., p. 87. This citation may be due to an error in herbarium records, or possibly the plant may have been a casual escape at a Mexican settlement at the time of Douglas' visit and did not persist. There is no other record of it and we have seen no California specimens.

Spermólepis Raf. Very slender glabrous annuals. Leaves finely dissected into filiform or linear segments. Umbels pedunculate, few-rayed; involucre none. Umbellets with very unequal pedicels; involucre present. Fruit ovate, flattened laterally, bristly-echinate, the bristles from tuberculate bases. Oil-tubes solitary in the intervals, 2 on the commissure. *S. ECHINATUS* Hel. Contrib. Herb. Franklin & Marshall College, 1:3 (1895). *Leptocaulis echinatus* Nutt. in DC. Prod. 4:107 (1830), type loc. Red River, Ark., *Nuttall*. Erect, dichotomously branching, $\frac{1}{3}$ to 1 foot high; fruit $\frac{1}{2}$ line long, with obsolete ribs.—Native of southeast U. S. Attributed to S. Cal. by Coulter & Rose (Contrib. U. S. Nat. Herb. 7:88), but they cite only a station in central Cal. (Oakland Hills, *Lemmon*.) Perhaps a transient escape or a case of mislabeling.

15. ÁMMI L.

Erect branching glabrous biennial with slightly fusiform roots and dissected decomposed leaves. Flowers white, in compound umbels. Bracts parted into filiform segments, reflexed. Bractlets lanceolate, acuminate, spreading or reflexed. Calyx-teeth obsolete. Fruit ovoid, very slightly flattened laterally. Ribs filiform. Oil-tubes solitary in the intervals and 2 on the commissure. (Greek name of an umbelliferous plant.)

Leaf segments spatulate, serrate or lacinate; fruiting rays spreading 1. *A. majus*.
Leaf segments filiform or narrowly linear, entire; fruiting rays closely contracted . . . 2. *A. visnaga*.

1. **A. majus** L. BISHOP'S WEED. Stem slender, branching above, $1\frac{1}{4}$ to $2\frac{1}{2}$ feet high; basal and lower leaves simply pinnate with 7 or 5 (or 3) obovate to oblong serrate leaflets $\frac{3}{4}$ to 3 inches long; upper leaves biternate or ternate-pinnate, the divisions narrowly oblanceolate, acute, lacinate or serrulate, especially at apex, about $\frac{1}{2}$ to 2 inches long; rays about 25 to 30, little unequal, $\frac{3}{4}$ to 2 inches long; pedicels 1 to $1\frac{1}{2}$ lines long; bracts linear below, parted above into 3 filiform divisions; bractlets lanceolate, acuminate, entire, scarious-margined at base; fruit less than 1 line long; carpels with concave face; oil-tubes solitary in the intervals, 2 on the commissure.—European weed, naturalized in the Napa Valley; low places.

Locs.—Yountsville, *Jepson* in 1893; Union sta., Napa Valley, *Jepson* 7435 in 1917; ne. of Salvador School near Napa River, *Jepson* 9066 in 1920.

Refs.—*AMMI MAJUS* L. Sp. Pl. 243 (1753); *Jepson*, Fl. W. Mid. Cal. 352 (1901).

2. **A. visnaga** Lam. Stout, $\frac{1}{3}$ to $2\frac{3}{4}$ feet high; leaves tri-ternately dissected into filiform segments 3 to 6 lines long; fruiting umbels and umbellets contracted; fruit about 1 line long.—European plant, naturalized in the Santa Clara Valley.

Locs.—Saratoga, *Jepson* 5156 in 1912, *H. A. Dutton* in 1920.

Refs.—*AMMI VISNAGA* Lam. Fl. Fr. 4:362 (1778). *Daucus visnaga* L. Sp. Pl. 242 (1753), type south European.

16. *CARUM* L.

Ours erect and slender glabrous biennials or perennials. Leaves simply pinnate with few linear entire leaflets. Flowers white, in compound umbels. Involucre of entire bracts or none. Involucels of entire bractlets. Calyx-teeth small. Stylopodium conical. Fruit ovate or oblong, somewhat laterally compressed, with filiform or salient ribs. Oil-tubes solitary in the intervals, 2 to 6 on the commissure. (Karon, Greek name of the Caraway.)

Leaflets linear; involucre none or of 1 or 2 small linear-setaceous bracts; ribs filiform.

Stems clustered, arising from a fascicle of coarse roots; involucre inconspicuous, of 1 or 2 small bracts or none; styles short.....1. *C. kelloggii*.

Stems solitary, arising from a tuber or cluster of tubers; styles long.

Fruit about 1 line long; Sierra Nevada and coastal, common.....2. *C. gairdneri*.

Fruit $1\frac{1}{2}$ to 2 lines long; Siskiyou Co., rare.....3. *C. oreganum*.

Leaflets ovate to oblong; stem solitary, from a tuber or a cluster of tubers; bracts of the involucre about 12 to 15, lanceolate, at length reflexed; ribs salient.....4. *C. howellii*

1. *C. kelloggii* Gray. Fig. 15.

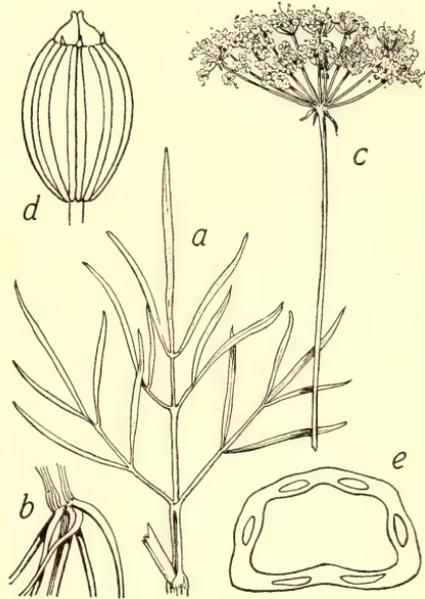
Stems several from a fascicle of coarse and hard fibrous roots, 3 to 5 ft. high; basal leaves 5 to 10 in. long, ternate, each division pinnate with narrowly linear divisions 3 to 4 in. long; cauline leaves similar but smaller; involucre bracts and involucre bractlets several, lanceolate or subulate; rays $\frac{3}{4}$ to $1\frac{1}{2}$ in. long; stylopodium very large, with short stout styles; carpels frequently unequal or only one maturing.—Dry open foothills, 100 to 500 ft.: Coast Ranges (Santa Clara Co. to Humboldt Co.); Sierra Nevada foothills (Tuolumne Co. to Butte Co.).

Locs.—Coast Ranges: Los Gatos, *Heller* 1535; Pt. Reyes, *Jepson* 1168; Fairfax Manor, Marin Co., *Jepson* 9490; Oakland Hills, *Jepson*; Vacaville, *Jepson*; Conn Valley, Napa Range, *Jepson* 6252 (dominant on 50 acres of the flat and in places nearly pure), 9071; Howell Mt., *Jepson*; Alton, Humboldt Co., *Tracy* 3999. Sierra Nevada: Hamilton sta. (Contrib. U. S. Nat. Herb. 7:103); New York Falls, Amador Co., *Hansen* 72; Ione, *Braunton* 1138; Shingle Sprs., *Kennedy*; Chico, *Heller* 11,678.

Refs.—*CARUM KELLOGGII* Gray, Proc. Am. Acad. 7:344 (1868), based on spms. from San Jose, *Brewer* 832, Oakland, *Bolander*, and Bolinas, *Kellogg*; *Jepson*, Fl. W. Mid. Cal. 352 (1901). *Ataenia kelloggii* Green, Pitt. 1:274 (1889).

Tax. note.—*C. kelloggii* and *C. gairdneri* grow on hillside spots which are very wet in winter and spring but excessively dry in summer and fall. On the western slopes of Howell Mt. colonies of these two species grow side by side. In *C. kelloggii* the umbel is convex, the flowers are dull white or sordid and the pedicels of the umbellets are spreading in fruit; in *C. gairdneri* the umbel is flat, the flowers are clear white and the pedicels are approximate in fruit.

2. *C. gairdneri* Gray. SQUAW-ROOT. Fig. 16. Stem solitary, 1 to $3\frac{1}{3}$ ft. high, from a tuberous root or a fascicle of such; leaves few, simply pinnate, the leaflets 3 to 7 (or 9), linear, 2 to 4 in. long; upper leaves mostly simple; flowering



15. *Carum kelloggii* Gray; a, leaf x $\frac{1}{3}$; b, root x $\frac{1}{3}$; c, umbel x $\frac{1}{3}$; d, fr. x $2\frac{1}{2}$; e, sect. carp. x 7.

rays 3 to 6 lines long, in fruit about twice as long; involucre of 1 or 2 linear acute bracts or none; involucels of few linear acuminate bractlets; fruit broadly oblong to elliptic or ovate, 1 to $1\frac{1}{2}$ (or 2) lines long; stylopodium low, with long slender styles.—Adobe flats or meadows or hills; Coast Ranges from Monterey Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Butte Co., gregarious and often whitening the moist meadows at 3000 to 7000 ft.

Econ. Note.—The tubers and the young shoots were used as food by the Pomos, in both cases being eaten raw. Doubtless other native tribes made similar use of them.

Locs.—Coast Ranges: Cypress Point, Monterey, *Jepson*; Pt. Joe, Monterey, *Jepson* 9743; Oakland Hills, *Jepson*; Lake Lagunitas, Marin Co., *Jepson* 9498; Howell Mt., *Jepson* 1726; Conn Valley, Napa Range, *Jepson*; Elk Mt., n. Lake Co., *Tracy* 2342; Eureka, *Tracy* 969; Sisson, *Jepson*; Yreka, *Buller* 925. Sierra

Nevada: Butte Mdws., *Heller* 11, 649; Little Tule River, *Purpus* 5632; Kelyt Mdw., Madera Co., *Kennedy*; Hetch Hetchy, A. L. *Grant* 870 (fruit 2 lines long); Yankee Hill, Columbia, A. L. *Grant* 557; Kennedy Mdw., Tuolumne Co., A. L. *Grant* 461; Eagle Creek, Tuolumne Co., A. L. *Grant*; Duffield Cañon, Soulsbyville, *Jepson* 7689; Riverton, El Dorado Co., *K. Brandegee*; Truckee, *Sonne*; Lake Independence, *Jepson* 8068; Sierra Valley, *Jepson* 8041; Martin Sprs., Eagle Lake, *Brown & Wieslander* 15.

Refs.—*CARUM GAIRDNERI* Gray, Proc. Am. Acad. 7:344 (1868), based on spms. from Ebbetts Pass (*Brewer*), Yosemite (*Bolander*), and near Carson City (*Anderson*); *Jepson*, Fl. W. Mid. Cal. 352 (1901).

C. LEMMONII C. & R. Bot. Gaz. 14:283 (1889), type loc. "Tuolumne forest" (near Crocker's Sta.), *Lemmon*. Obscure and little understood. It would appear to be difficult to distinguish it from *Eulophus parishii* C. & R. in the flowering stage.

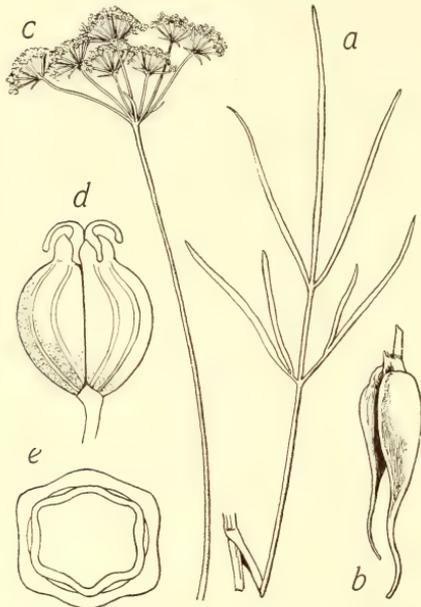
3. *C. oreganum* Wats. Resembling *C. gairdneri* Gray; leaves more divided with shorter leaflets; fruit $1\frac{1}{2}$ to 2 lines long; seed sulcate

beneath the oil tubes.—Siskiyou Co. North to British Columbia

Loc.—Mt. Shasta acc. *Coulter & Rose* (Contrib. U. S. Nat. Herb. 7:105, fig. 27).

Ref.—*CARUM OREGANUM* Wats. Proc. Am. Acad. 20:368 (1885), type loc. Wappatoo Isl., Ore., *Nuttall*. *Ataenia oregana* Greene, Pitt. 1:274 (1889).

4. *C. howellii* C. & R. Fig. 17. Stem stoutish, $2\frac{1}{2}$ to $4\frac{1}{2}$ ft. high, arising from a heavy cluster of very stout very fibrous fusiform roots; leaves bipinnate, mostly lanceolate in outline; leaflets crowded, broadly oblong to ovate, acute, coarsely but sparingly serrate or sparingly incised, $\frac{3}{4}$ to $1\frac{3}{4}$ in. long; rays 16 to 40, $\frac{3}{4}$ to $2\frac{3}{4}$ in. long in fruit; pedicels 2 to 5 lines long; bracts several, narrowly lanceolate; reflexed, 8 to 12 lines long; bractlets similar, mostly reflexed, nearly as long as the pedicels, scarioso-margined; fruit 2 lines long; ribs thick-based, acute.—Moist mountain meadows, 2000 to 3600 ft.: Mariposa Co. to Nevada Co.; Mendocino Co. to Siskiyou Co. North to Oregon.



16. *Carum gairdneri* Gray; a, leaf x $\frac{1}{2}$; b, root x $\frac{1}{2}$; c, umbel x $\frac{1}{2}$; d, fr. x 8; e, sect. carp. x 16.

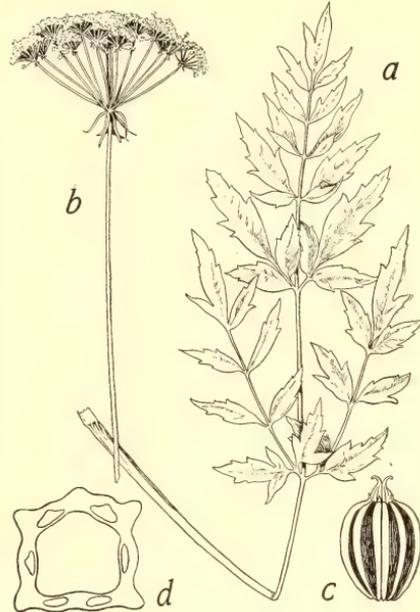
Econ. Note.—While all our *Carum* species are eaten by cattle this species is especially relished; and apparent scarcity may be due to the fact that it is a valued forage plant. Specimens, especially fruiting specimens, are seldom seen in herbaria.

Locs.—Mariposa Co., *Congdon* (Westfalls, Wawona and Darrah); Bear Valley, Nevada Co., *Jepson*; Long Valley, Mendocino Co., *C. S. Myszka*; Murphy Mdw., Bald Mt., Humboldt Co., *Tracy* 4832; *Sisson*, *Jepson* 6157.

Refs.—*CARUM HOWELLII* C. & R. *Rev. N. A. Umbell.* 129 (1888), type loc. Grants Pass, Ore., *Howell* 710. *Ataenia howellii* *Green Pitt.* 1:274 (1889). *Taeniolepurum howellii* C. & R. *Bot. Gaz.* 14:284 (1889); C. & R. *Contrib. U. S. Nat. Herb.* 7:102, fig. 26 (1900).

17. *EULOPHUS* Nutt.

Glabrous erect perennials with deep-seated fascicled tubers, the leaves all basal or the cauline few and small. Leaves compound with the terminal segments or leaflets often differing markedly from the lateral ones; lateral leaflets linear and entire, rarely ovate or oblong and incised; terminal leaflet elongated, always entire and often caudate. Flowers white or pinkish. Umbels compound, long-peduncled. Bracts of involucre and bractlets of involucre similar, several, lanceolate to obovate, acuminate. Calyx-teeth prominent. Fruit ovate to linear-oblong, flattened laterally. Ribs filiform, equal. Stylopodium conical, with long strongly recurved or deflexed styles. Oil-tubes 1 to 5 in the intervals, 4 to 8 on the commissure. Seed-face broadly concave, with a central longitudinal ridge. (Greek eu, true, and lophus, crest, in reference to the salient terminal leaflet.)



17. *Carum howellii* C. & R.; *a*, leaf $\times \frac{1}{3}$; *b*, umbel $\times \frac{1}{3}$; *c*, fr. $\times 3$; *d*, sect. carp. $\times 8$.

Terminal leaflet commonly much longer than the lateral ones.

- | | |
|---|-----------------------------|
| Rachis of the leaves not dilated. | |
| Oil tubes solitary in the intervals; fruit 3 to 4 lines long | 1. <i>E. californicus</i> . |
| Oil tubes more than one in the intervals (as also in nos. 3 to 5); fruit 2 lines long | 2. <i>E. bolanderi</i> . |
| Rachis of the leaves dilated, the segments few and mostly short | 3. <i>E. pringlei</i> . |
| Terminal leaflet similar to the lateral ones; leaflets 1 to 3 in. long. | |
| Bractlets narrowly lanceolate | 4. <i>E. parishii</i> . |
| Bractlets ovate, cuspidate | 5. <i>E. cuspidatus</i> . |

1. *E. californicus* (Torr.) C. & R. Fig. 18. Stems generally 1 to 3, 3 to 5 ft. high; leaves basal, twice or thrice ternate, then pinnate or pinnately divided, the segments or leaflets ovate, 3 to 7 lines long, incised or serrate, the terminal leaflet linear-elongated, entire, $\frac{1}{2}$ to 2 in. long; fruiting rays 1 to $2\frac{3}{4}$ in. long; fruit linear-oblong, 3 to 4 lines long; oil-tubes large, solitary in the intervals, sometimes an extra one in one of the intervals, 4 on the commissure.—Along streams, Sierra Nevada foothills from Stanislaus Co. to Mariposa Co.; Mt. Hamilton Range.

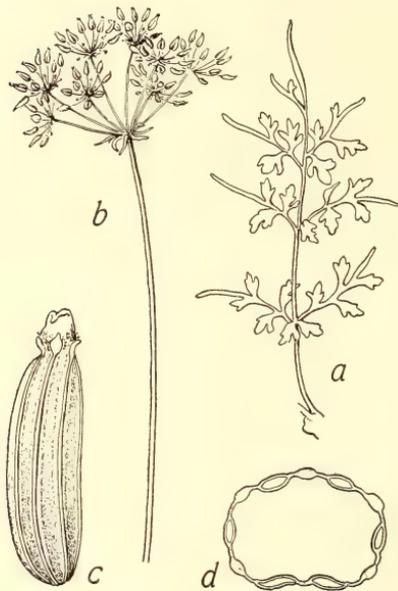
Locs.—White's Gulch, Mariposa Co., *Congdon*; Arroyo Hondo, Mt. Day, *R. J. Smith*.

Var. *SANCTORUS* Jepson n. var. Lateral segments narrower, disposed to be unilaterally or unequally lobed.—Southern Monterey Co. (San Carpojo, *J. J. Condit*).

Refs.—*EULOPHUS CALIFORNICUS* C. & R. Rev. N. A. Umbell. 114 (1888). *Chaerophyllum* (?) *californicum* Torr. Pac. R. P. Rep. 4^o:93 (1856), type loc. Knight's Ferry, Stanislaus Co., *Pigelow*.

2. *E. boländeri* (Gray) C. & R. Plants 1 to 2 ft. high; tubers 1 to 8, obfusiform or oblong; herbage glabrous; leaves once, twice or thrice ternate, the ultimate lateral ones linear, the divisions 2 to 12 lines long, the ultimate central division 1 to 3 in. long; fruiting rays 4 to 10 lines long; pedicels 1½ to 2 lines long; bracts few, lanceolate, scarious, or none; bractlets several, narrowly to ovate-lanceolate, abruptly acuminate, scarious, rather shorter or sometimes longer than the pedicels; fruit oblong, 2 lines long, oil-tubes minute, 2 to 5 in the intervals, 6 on the commissure.—Sierra Nevada and Yollo Bolly Mts., 6000 to 9000 ft. Northward to Oregon and Idaho.

Locs.—The leaves are highly variable in expression. They vary greatly in size and shape on different individuals; the lateral leaflets are typically short, but often long; they are entire but often toothed. The form most typical of the species has leaves which exhibit dimorphic leaflets, that is, the lateral leaflets are short and the terminal leaflet long, with which marked difference in length there may sometimes be associated a difference in shape. This type is illustrated by the following (a): Cedar Creek to Old Colony Mill, North Fork Kaweah River, *Jepson* 654; Mt. Silliman, *Jepson* 735; Yosemite, *Congdon*; Chilnualna Falls, *Congdon*; Hot Springs Valley, Lassen Peak, *Jepson* 4100. The following (b) appear to be more or less evidently dimorphic in leaflets: Hackberry Cañon, Caliente, *K. Brandegee*; Pah Ute Peak, Kern Co., *Purpus* 5293; Little Kern River, *Jepson* 4915; Conness Creek, Tuolumne River; *Jepson* 3365; Boca, *M. K. Curran*;



18. *Eulophus californicus* C. & R.; a, leaf x ⅜; b, umbel x ⅜; c, fr. x 5; d, sect. carp. x 9.

Portola, Plumas Co., *K. Brandegee*; Ft. Bidwell, *Manning*; Bald Mt., ne. Shasta Co., *Hall & Babcock* 4257; South Yollo Bolly, *Jepson*. Some of "b" pass into the var. *BENIGNUS* Jepson n. var. Leaflets filiform-linear, 1 to 2 in. long, essentially alike.—Hetch Hetchy, *A. L. Grant* 870 (type).

Refs.—*EULOPHUS BOLANDERI* C. & R. Rev. N. Am. Umbell. 112 (1888). *Podosciadium bolanderi*, Gray, Proc. Am. Acad. 7:346 (1868), type loc. Mariposa Trail, Yosemite, *Bolander*.

3. *E. pringlei* C. & R. Stem 1 to 1½ ft. high; leaves pinnately compound with broad inflated midrib, the primary divisions once or twice pinnately divided into few linear-filiform or linear-subulate segments 1 to 6 lines long, the terminal segment 2 to 10 lines long; rays 5 to 10, ½ to 1½ in. long; pedicels 1 to 2 lines long; involucre of 1 or 2 very small bracts; involucre of several subsarious lanceolate bractlets 1 to 2 lines long; fruit oblong, 2 to 2½ lines long; oil-tubes

(To be continued)

MADROÑO

JOURNAL OF THE
CALIFORNIA BOTANICAL
SOCIETY



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October, 1923

MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY

The purpose of this Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora, and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographical distribution of the native plants will be especially welcome.

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YUCCA WHIPPLEI IN THE SIERRA FOOTHILLS

WALTER FRY

Game Warden S. L. N. Ellis reports *Yucca Whipplei* in the Sierra foothills as far north as the mouth of Boulder Creek and the cañons of the Merced River southeast from Anderson Valley in Mariposa County. From observations made in the Sequoia National Park for 25 years past it appears that the *Yucca Whipplei* tends to spread northward.

According to the late Hale D. Tharp, of Three Rivers, there were no *Yuccas* in the Sequoia Park prior to 1860, when the first specimen was seen along the trail which he had built the previous year. At that time the nearest known *Yuccas* were on Tule River, several miles to the south of the park, and it is reasonable to suppose that some bird carried the seed north.

At the time Sequoia Park was created in 1890 the Alder Creek grove of *Yuccas* contained but few plants; by September, 1905, these had grown to 397 by an actual count, of which 39 had borne fruit that year; and now there are over 5,000. The rapid increase is due to protection from forest fires. Three times the Alder Creek grove of *Yuccas* has been threatened but each time rangers have promptly fought the fires and saved the *Yuccas*.

NOTES AND NEWS

Mr. L. H. Weld, U. S. Bureau of Entomology, who is conducting an investigation of oak galls, visited California in April, 1922.

Mr. C. C. Marshall, one-time collector of the flora of Humboldt County and discoverer of *Ribes Marshallii* and *Saxifraga Marshallii*, was a visitor at the regular meeting of the Society in March, 1921.

Dr. Seuja Ito, Professor of Phytopathology, Hokkaido Imperial University, Sapporo, Japan, was a visitor at the regular meeting of the Society in September, 1921.

Miss Laura F. McDermott, author of an illustrated monograph on North American *Trifoliums*, died in San Diego, June 24, 1923. She was born at Virginia City, Nevada, July 23, 1882; graduated from the University of Nevada in 1906; received the masters degree in the following year, and was granted the masters degree in botany at the University of California later in the same year. She has been for ten years a successful teacher of botany in the San Diego High School.

THE SNOW PLANT OF CALIFORNIA

JOHN HENRY ELWES

When I was at Berkeley three years ago I remember talking with you as to the supposed connection between the roots of *Sarcodes*

sanguinea and those of the conifers among whose roots it always grows. We had recently lifted some of the plants and put them in a garden on the way up to Yosemite, where we stayed the night; in the hope of learning whether they would live, when moved with the whole of the fleshy root mass from which the plants shoot, which appeared to me to be perennial. I have lately turned up a paper on this very curious and beautiful plant written by Professor Oliver in the *Annals of Botany*, vol. 4, no. 15, August, 1890, p. 300 et seq., from material which Godman and I collected near San Bernardino in 1888. Since then I know of no account giving further details of the life history of the plant which I am very anxious to know more about. Can you let me know whether it has been studied in nature by any American botanist and whether anything is published on the subject? Also whether the plant has ever been successfully kept alive in a garden or raised from seed?

I could not either in the San Bernardino Mountains or in Yosemite find any plants which looked like seedlings, and yet the sporadic way in which the plant grows made me think that would be its normal way of reproduction.—Jan. 3, 1922, Colesborne, Gloucester, England.

Mr. Elwes is an English farmer who has always been a great traveler and student of natural history. His acute and interesting observations were often made use of by Darwin, Wallace and other naturalists. He is the author, with A. Henry, of a great illustrated work on the Trees of Great Britain.

Since the above letter was written Mr. Elwes has died in England, but it seems desirable to publish his query and so stimulate further field observations or experiments on one of our most interesting Sierran species of flowering plants.—W. L. JEPSON.

OPEN LETTERS

Umbellularia Californica in Lake County

Last week I stopped two nights at Laurel Camp on the north side of Clear Lake near Bartlett Landing. The California Laurels (*Umbellularia Californica*) there are very interesting. They have the habit of reproducing a group surrounding an old decayed stump in much the manner of *Sequoia sempervirens*. The tree we camped under gave at noon a shadow spread of 94 feet. Its trunk diameter could not be taken because of irregular shape, but a very perfectly shaped tree close by had a trunk circumference of 18 feet, 1 inch at about 4 feet above the ground, being its least diameter, for it branched just above that point, thus giving a calculated diameter of 5.72 feet. This tree stands uncrowded, it is in perfect health and is a remarkably fine specimen.—F. C. YEOMANS, Aug. 2, 1923.

A REVISION OF CALIFORNIAN UMBELLIFERAE.—III.

WILLIS LINN JEPSON

(Continued from page 130)

3 to 5 in the intervals, 8 on the commissure.—Inner South Coast Ranges from San Luis Obispo Co. to northern Los Angeles Co.

Locs.—San Luis Obispo Co., *R. W. Summers*; Antelope Valley, *Davidson*; Harold, Los Angeles Co., *Davidson*; Acton, Los Angeles Co., *Davidson*.

Ref.—EULOPHUS PRINGLEI C. & R. Rev. N. Am. Umbell. 113 (1888), type from Cal., *Pringle* 40.

4. **E. parishii** C. & R. Stem usually very slender, $\frac{2}{3}$ to $1\frac{1}{4}$ (or $2\frac{1}{2}$) ft. high; tubers 1 to 3, fusiform; leaves ternate, sometimes biternate; leaflets narrowly linear to narrowly lanceolate, 1 to 3 or $4\frac{1}{2}$ in. long, the terminal sometimes distant; uppermost leaves simple, bract-like; rays 5 to 22, 4 to 7 or 11 lines long in fruit; pedicels 1 to 2 lines long; involucre none or scanty; bractlets 2 to 6, narrowly lanceolate, 2 lines long; fruit oblong to ovate, 1 to $1\frac{1}{2}$ lines long; oil tubes 2 to 5 in the intervals, 6 on the commissure.—Bogs and meadows, 6000 to 8000 ft.: mountains of Southern California (not uncommon); central and southern Sierra Nevada (rare).

Locs.—Cuyamaca, *T. Brandege* (very stout); Tahquitz Valley, Mt. San Jacinto, *Hall* 851; South Fork Mdws., Santa Ana Cañon, *Hall* 7538; Bear Valley, San Bernardino Mts., *Parish* 3171, 3730. Sierra Nevada: Hockett Mdw., Tulare Co., *C. F. Baker* 4450; Poison Mdw., Soda Cañon, upper Kern River, *Jepson* 1116; Silver Creek, Eldorado Co., *Kennedy* 163. The following have ternate leaves with narrow leaflets (*E. simplex* C. & R.) and are in flower only but appear to belong here: Simpson Mdw., Middle Fork Kings River, *Henrietta M. Eliot*; Piute Creek, Pleasant Valley, Yosemite Park, *Jepson* 3400; Placer Co., *Carpenter*; Bear Valley, Nevada Co., *Jepson*.

Refs.—EULOPHUS PARISHII C. & R. Rev. N. Am. Umbell. 112 (1888). *Pimpinella parishii* C. & R. Bot. Gaz. 12:157 (1887), type loc. Bear Valley, San Bernardino Mts., *S. B. & W. F. Parish* 987. *E. simplex* C. & R. Contrib. U. S. Nat. Herb. 7:112 (1900). *E. pringlei* var. *simplex* C. & R. Rev. N. Am. Umbell. 113 (1888), Sierra Co., *Lemmon*. *Carum gairdneri* var. *latifolium* Gray, Proc. Am. Acad. 7:344 (1868), type loc. Sierra Co., *Lemmon*.

5. **E. cuspidatus** Jepson n. sp. Stem slender, 6 to 9 in. high, sparingly branched; leaves bipinnately divided into few linear divisions; rays 6 to 10, 2 to 5 lines long; pedicels 1 to 2 lines long; bracts 4 to 6, obovate, membranous, erosulate at the truncate or obtuse apex, 2 lines long; tipped by a bristle 1 to $1\frac{1}{2}$ lines long; fruit (immature) ovate, obscurely short-beaked, $1\frac{1}{2}$ lines long.—Calaveras Co.

Loc.—Table hills near Mountain Ranch, Calaveras Co. (Davy 1618, type).

18. **CICÛTA** L. WATER HEMLOCK.

Tall branching glabrous perennials growing in marshes or by stream banks. Rootstocks short and erect, or horizontal and branching. Leaves at least partially twice or thrice pinnate. Flowers white, in compound umbels. Involucre present or none. Involucels of small bractlets. Calyx-teeth somewhat prominent. Styles somewhat short. Fruit flattened laterally, broadly ovate to roundish. Ribs corky, broad but low, the lateral in cross section larger than the intermediate and dorsal. Oil tubes 2 on the commissure, solitary in the intervals. (Classical name of the Hemlock, which was given to criminals, and sometimes, when the Greeks had a superfluity, to philosophers, as a death-poison.)

Fruit with the intervals red-brown, contrasting with the corky ribs; intervals broad.

Plants of living streams.

Leaves simply pinnate or partially bipinnate below.....1. *C. californica*.

Leaves bi- to tri-pinnate.....2. *C. douglasii*.

Plants of salt-marshes.....3. *C. bolanderi*.

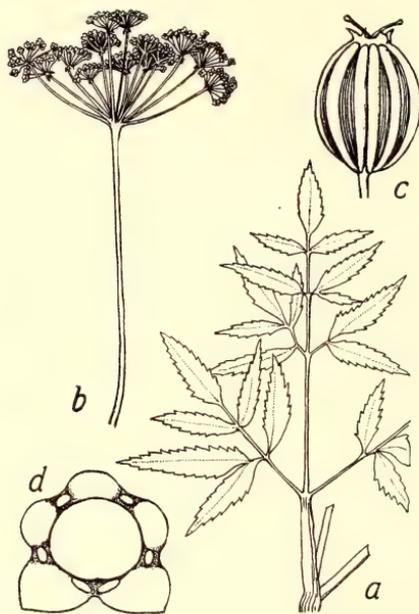
Fruit with intervals of much the same color as the ribs; intervals very narrow.....

4. *C. vagans*.

1. *C. californica* Gray. CALIFORNIA WATER HEMLOCK. Stems about 3 ft. high; basal leaves pinnate or partly bipinnate below, 1 to 2½ ft. long, on long (½ to 1½ ft.) petioles; leaflets ovate-lanceolate or lanceolate, serrate, 3 to 5 in. long, often deeply 1-lobed on one side towards the base so as to make a supplementary leaflet; rays somewhat unequal, 1¼ to 2½ in. long; pedicels 2 to 4 lines long; involucre none, or merely 1 narrow bract; bractlets several, ovate, acuminate; fruit 1 to 1¼ lines long with narrow not depressed oil tubes, those on the face approximate near the median line; ribs large and corky, rounded, yellowish, the intervals very narrow or lineate, dark red-brown.—Coast region, from Mendocino and Lake Cos. to Monterey Co.

Locs.—Mt. Hull, *Hall* 9573; Leona, Oakland Hills, *Michener*; Ben Lomond, *C. E. Worden*; Carmel River, *Jepson*.

Refs.—*CICUTA CALIFORNICA* Gray, Proc. Am. Acad. 7:344 (1868), type loc. Monterey, *Hartweg* 1754. *C. virosa* L. var. *californica* C. & R. Rev. N. Am. Umbell. 130 (1888); *Jepson*, Fl. W. Mid. Cal. 351 (1901).



19. *Cicuta douglasii* C. & R.; a, leaf x ½; b, umbel x ¼; c, fr. x 5; d, sect. carp. x 10.

2. *C. douglasii* (DC.) C. & R. WESTERN WATER HEMLOCK. Fig. 19. Stems stout, glaucous, 3 to 4 ft. high; herbage often purplish; rootstocks short; leaves bipinnate; leaflets sessile or nearly so, lanceolate, 1½ to 4 in. long, coarsely incised-serrate to serrulate, sometimes falcate; involucre none or of a few lanceolate bracts; involucrels consisting of 9 to 12 lanceolate-acuminate bractlets; rays 1½ to 2½ in. long; pedicels 2 lines long; fruit sub-orbicular, 1 to 2 lines long; ribs very broad and low; intervals narrow, red-brown, sharply defined from the light-colored ribs; oil tubes small; seed not channeled under the oil tubes.—Mountain streams, almost throughout California; north to Alaska.

Locs.—Humboldt Bay, *Tracy* 2597; Bald Mt. between High Prairie and Snow Camp, *Tracy* 4612; *Sisson*, *Jepson*, *Geo. B. Grant*; Edgewood, *T. Brandegee*; Ft. Bidwell, *Jepson* 7921; Quincy, *Hall* 7376; Red Mdw., *Madera* Co., *A. L. Grant* 1561a; Lone Pine, *Jepson* 5153; Los Angeles, *Parish*, *Davidson*.

Refs.—*CICUTA DOUGLASII* C. & R. Contrib. U. S. Nat. Herb. 7:95 (1900). *Sium douglasii* DC. Prod. 4:125 (1830), type from northwest America, *Douglas*. *C. occidentalis* Greene, f. *frondosa* Greene, Pitt. 2:7 (1889), type loc. Tehachapi, *Greene*. *C. frondosa* Greene, Leaflets, 2:236 (1912). *C. valida* Greene, l. c. 239, type loc. e. slope Sierra Nevada in Mono Co., *Bolander*.

3. *C. bolanderi* Wats. Stem 5 to 10 ft. high, branched above, with nearly or quite vertical rootstock and large basal and cauline bipinnate leaves ¾ to 2 ft. long; leaflets lanceolate, serrate, 1¼ to 3 in. long; bracts and bractlets lanceolate, the former often scarious-margined; rays 1 to 1½ in. long, subequal, pedicels 2 lines long; fruit 1½ to 2 lines long, prominently ribbed, the carpels when quite mature rather strongly concave on the commissure, thus appearing somewhat lunate; oil tubes broad, depressed in the channeled seed.—Marshes about Suisun Bay.

Locs.—Suisun Marshes, *Jepson* 2460c; Benicia, *Jepson*; Martinez, *Davy* 6668.
 Refs.—*CICUTA BOLANDERI* Wats. Proc. Am. Acad. 11:139 (1876), type loc. Suisun Marshes, *Bolander*; *Jepson*, Fl. W. Mid. Cal. ed. 2, 296 (1911).

4. *C. vagans* Greene. Habit and appearance of *C. douglasii*; corky ribs low and broad, brownish, the intervals of the same color and not revealing the oil tubes.—East side of the northern Sierra Nevada. North to Idaho.

Locs.—Truckee, *Sonne*, *Kennedy* 4603.

Refs.—*CICUTA VAGANS* Greene, Pitt. 2:9 (1889), type loc. Lake Pend d'Oreille, Ida., *Greene*. *C. sonnei* Greene, Leaflets, 2:239 (1912), type loc. Truckee, *Sonne*, *Greene*.

19. OENANTHE L.

Aquatic glabrous herbs with succulent stems from thick rootstocks. Leaves pinnately compound. Flowers white, in compound umbels terminating the branches. Involucre present or none. Involucels present. Calyx-teeth rather prominent. Styles slender, at length elongated. Fruit in ours cylindric, slightly flattened laterally. Ribs broad, obtuse, corky; commissural face also corky. Oil tubes solitary in the intervals, 2 on the commissure, the seed furrowed beneath them.—Species about 30, all continents. (Ancient Greek name of some thorny plant.)

1. *O. sarmentosa* Presl. Fig. 20. Stems 2 to 4 ft. high; leaves bipinnate, or the lowest ones elongated-pinnate (1 to 2 ft. long), or partially bipinnate towards the base; leaflets ovate, serrate, coarsely toothed or incised, $\frac{3}{4}$ to $1\frac{1}{2}$ (or $2\frac{1}{2}$) in. long; rays $\frac{3}{4}$ to 1 in. long; bracts few or none; bractlets lanceolate, acuminate; fruit 1 to 2 lines long, the ribs very corky and somewhat turgid.—Slow streams or shallow ponds, often filling them with dense masses: Southern California, Coast Ranges and northern Sierra Nevada. North to British Columbia.

Biol. note.—In autumn the stems give rise from the lower nodes to slender runner-like branches 3 to 5 ft. long which at intervals produce bulblets $\frac{1}{2}$ in. in diameter or less. Herbage often reddish.

Locs.—Samoa, Humboldt Co., *Tracy* 3088; Ft. Bragg, *W. C. Mathews*; Amador Co. (acc. *Coulter & Rose*); Alviso, *Jepson* 9316 (intergrade to var. californica); Carmel River, *Jepson*; Ballona Creek, Los Angeles Co., *Abrams* 2526; San Bernardino Valley, *S. B. & W. F. Parish* 976; Palomar, *T. Brandegee*; Laguna Mts., San Diego Co., *T. Brandegee*. The species passes by indefinite gradations into the var. CALIFORNICA C. & R., the leaflets of the upper leaves crowded on the rachis and tending to be conduplicate.—Chiefly central Coast Ranges: Blue Lakes, Lake Co., *Jepson*; Suisun Marshes, *Jepson*; Howell Mt. foothills, *Jepson* (bractlets very conspicuous, exceeding the flowers); Pt. Reyes, *Jepson* 1178 (fruit ovoid-cylindric); Mt. Tamalpais, *Jepson*; Jarvis Ldg., Alameda Co., *Jepson*; San Jose, *Jepson*; Santa Cruz, *Kennedy*.

Refs.—*ONEANTHE SARMENTOSA* Presl; DC. Prod. 4:138 (1830), type loc. Nootka Sound, Vancouver Isl., *Haenke*; *Jepson* Fl. W. Mid. Cal. 354 (1901).

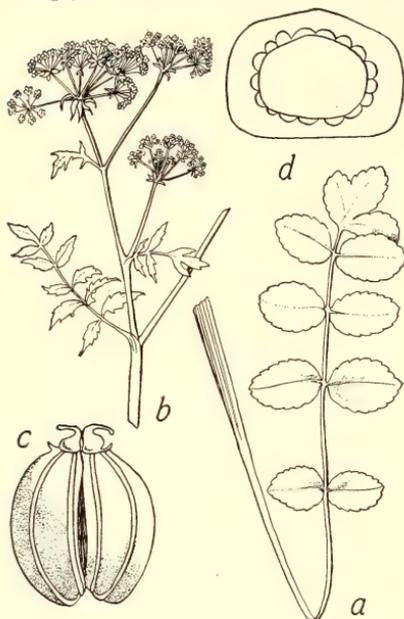


20. *Oenanthe sarmentosa* Presl; a, leaf $\times \frac{1}{2}$; b, umbel $\times \frac{1}{2}$; c, fr. $\times 4$; d, sect. carp. $\times 8$.

Var. CALIFORNICA C. & R. Rev. N. A. Umbell. 92 (1888), type loc. Point Lobos, San Francisco, *Kellogg*; Contrib. U. S. Nat. Herb. 7:122, fig. 35 (1900); Jepson l. c. ed. 2, 298 (1911). *O. californica* Wats. Proc. Am. Acad. 11:139 (1876), marshes at Pt. Lobos and Merced Lake and southward to San Diego Co.; Jepson, l. c. ed. 1:354 (1901).

20. BÉRULA Hoffm.

Glabrous aquatic or marsh perennial. Leaves simply pinnate, the leaflets sharply and often somewhat saliently serrate. Involucre and involucels present, the bracts and bractlets narrow. Flowers white, in compound umbels. Calyx teeth minute. Fruit roundish, flattened laterally, obscurely notched at base. Carpels with very slender and inconspicuous ribs and thick corky pericarp. Oil tubes numerous, contiguous, surrounding the seed. (Latin name of the Water Cress.)



21. *Berula erecta* Cov.; a, leaf $\times \frac{3}{8}$; b, fl. branchlet $\times \frac{1}{2}$; c, fr. $\times 12$; d, sect. carp. $\times 15$.

1. *B. erecta* (Huds.) Cov. Fig. 21. Erect, corymbosely branching, $\frac{1}{2}$ to 2 ft. high; leaflets 3 to 9 pairs, ovate to oblong, 1 to $2\frac{1}{2}$ in. long; fruiting rays $\frac{1}{2}$ to 1 in. long; pedicels $1\frac{1}{2}$ to 2 lines long; fruit $\frac{3}{4}$ line long.—Swamps and streams, coastal Southern California, northerly through the desert to Inyo Co. and Siskiyou Co. Throughout North America, Europe, Asia.

Locs.—Ramona, *K. Brandegee*; Los Angeles, *Geo. B. Grant* 104; Pasadena, *McClatchie* 475; Oak Knoll, *Braunton* 647; Ft. Tejon (acc. *Coulter & Rose*); Owens Lake, *Jepson* 5113; Restings sprs. (acc. *Coville*); *Sisson, Jepson*. Also attributed to San Mateo by *Greene*.

Refs.—BERULA ERRECTA Cov. Contrib. U. S. Nat. Herb. 4:115 (1893); C. & R. Contrib. U. S. Nat. Herb. 7:116, fig. 32 (1900). *Sium erectum* Huds. Fl. Angl. 103 (1762), type loc. presumably England; *Jepson, Fl. W. Mid. Cal.* 354

(1901). *Berula angustifolia* Brew. & Wats. Bot. Cal. 1:260 (1876).

21. SĪUM L. WATER PARSNIP.

Glabrous perennial marsh or aquatic herbs with leafy stems. Leaves simply pinnate. Flowers white, in compound umbels. Bracts and bractlets several to many. Calyx-teeth minute. Styles short. Stylopodium depressed. Fruit ovate or oblong, somewhat laterally compressed, with narrow commissure. Ribs corky, prominent or somewhat salient, with broad red-brown intervals. Oil tubes 1 to 3 in the intervals, always 2 or 3 in at least one of the intervals, 2 to 6 on the commissure. (Sion, Greek name of some water plant.)

1. *S. cicutæfōlium* Gmel. Fig. 22. Stem stout, $2\frac{1}{2}$ to $3\frac{1}{2}$ ft. high, from a cluster of fleshy-fibrous roots; leaves $\frac{1}{2}$ to $3\frac{1}{2}$ ft. long; leaflets 5 to 13, lanceolate, serrate, 2 to 4 in. long; bracts and bractlets ovate to lanceolate, the bracts reflexed, scarious-margined below; fruit ovoid, $1\frac{1}{2}$ lines long, with acute ribs.—Sloughs and ponds from Siskiyou Co. to Lassen Co. and Modoc Co. North to British Columbia, east to Virginia.

Locs.—Sisson, *Jepson*; Upper Fall River Valley, *Jepson* 5768; Honey Lake Valley, *Davy* 3363; South Fork Valley, Modoc Co., *Jepson* 7824; Egg Lake, *M. S. Baker*.

Var. *HÉTÉROPHÝLLUM* *Jepson*. Lowest leaves simple, on long fistulose petioles, or few-pinnate.—Marshes in the Great Valley: Suisun Marshes, *Jepson* 2460e; Stockton, *Greene*.

Refs.—*SIUM CUCUTAEFOLIUM* Gmel. *Sys.* 2:482 (1791). Var. *HÉTÉROPHÝLLUM* *Jepson*, *Fl. W. Mid. Cal.* 353 (1901). *Sium heterophyllum* *Greene*, *Pitt.* 2:102 (1890), type loc. Suisun Marshes, *Greene*.

22. *ÖROGENIA* Wats.

Dwarf glabrous perennial herbs with fleshy roots. Stem very short, mostly underground, sheathed by large scarious bracts. Leaves basal, ternate or biternate, with linear segments. Involucre none. Involucels of few linear bractlets. Flowers white, in partly compound umbels, the rays very unequal. Fruit oblong, only slightly flattened laterally. Carpels flattened dorsally; dorsal and intermediate ribs filiform; lateral ribs strongly corky thickened, extended towards the companion carpel so as to leave a large central cavity which is divided longitudinally by a thick corky ridge from the middle of each face. Oil tubes small, 3 in the intervals, 2 to 4 on the commissure. (Greek *oros*, mountain, and *genos*, race, referring to the habitat.)

1. *O. fusiformis* Wats. Plants 3 to 4 in. high, arising from a long fusiform root; leaf segments $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; umbels 2 to 10-rayed; fruit about 3 lines long.—Wet sandy soil, northern Sierra Nevada from Nevada Co. to Plumas Co. North to Oregon.

Locs.—Road to Donner Lake near Truckee, *Sonne*; Prosser Creek, Nevada Co., *Sonne*. Ashland Butte, s. Ore., *Cusick* 2892.

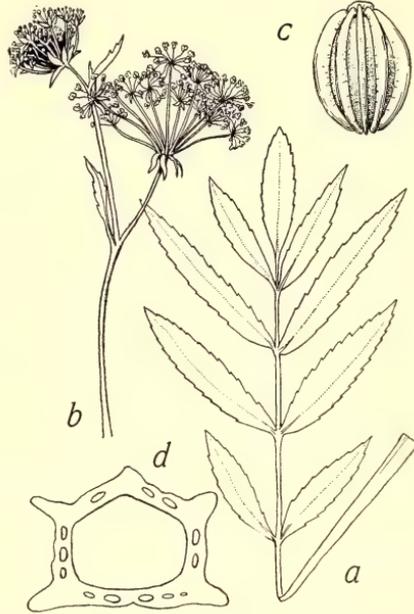
Refs.—*ÖROGENIA FUSIFORMIS* Wats. *Proc. Am. Acad.* 22:474 (1887), type loc. Plumas Co., *R. M. Austin*.

23. *LIGÚSTICUM* L. LOVAGE.

Perennial herbs with large aromatic roots. Herbage glabrous. Leaves bi- or tri-ternate in ours, with pinnate divisions. Flowers white or pinkish, in many-rayed compound umbels. Involucre none. Involucels of narrow bractlets. Calyx teeth small or obsolete. Fruit oblong or ovate, a little flattened laterally. Ribs prominent, acute or slightly winged, equal. Oil tubes mostly 3 to 5 in the broad intervals, 6 to 10 on the commissure. (Name derived from Liguria, a province of Italy, where Lovage, *Ligusticum levisticum* L., is endemic.)

Stem more or less leafy; rays and leaf-margins scabrous; coastal. 1. *L. apiodorum*.
Stem not leafy or with 1 reduced leaf; rays and leaf-margins not scabrous; montane. 2. *L. grayi*.

1. *L. apiodorum* (Gray) C. & R. Fig. 23. Stems more or less leafy, 2 to 3 (or 6) ft. high; rays and the margins of the leaflets and commonly the



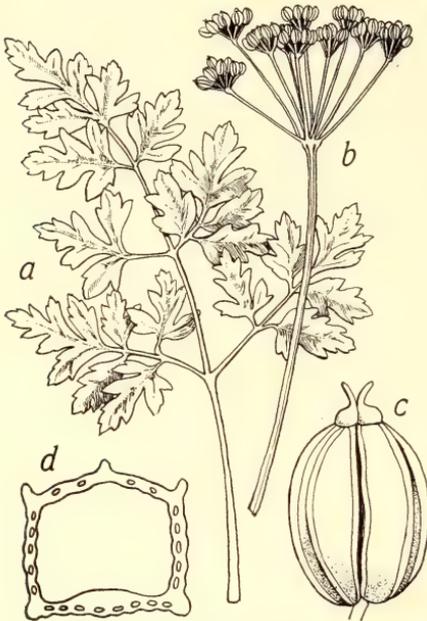
22. *Sium cucutaefolium* Gmel.; a, leaf x $\frac{1}{2}$; b, umbels x $\frac{1}{2}$; c, fr. x 6; d, sect. carp. x 12.

peduncles and the nerves of the leaflets tri-ternate, then the divisions pinnate with

3 or 5 leaflets; leaflets broadly ovate in outline, laciniately pinnatifid, $\frac{1}{2}$ to 2 in. long; fruiting rays $\frac{3}{4}$ to 1 (or $1\frac{1}{2}$) in. long; bractlets linear-setaceous, few or none; fruit broadly oblong, $1\frac{1}{2}$ to 2 lines long, the ribs very sharp; oil tubes 4 or 5 in the dorsal intervals, 5 or 6 in the lateral ones, 6 to 8 on the commissure.—Rocky or brushy hills, San Francisco to Humboldt Co. June.

Locs.—Colma, San Mateo Co., Pendleton 627; Bay View Hills, San Francisco, E. Cannon; Pt. Reyes, Davy 6766, 6768b; Kenwood, Blasdale; Eureka, Tracy 971; Dinsmore Ranch, Van Duzen River Valley, Tracy 3970; Hupa road near Redwood Creek, Jepson 1959; Gilbert Creek, Del Norte Co., Jepson 9356.

Refs.—*LIGUSTICUM APIODORUM* C. & R. Contrib. U. S. Nat. Herb. 7:132 (1900). *Pimpinella apiodora* Gray,

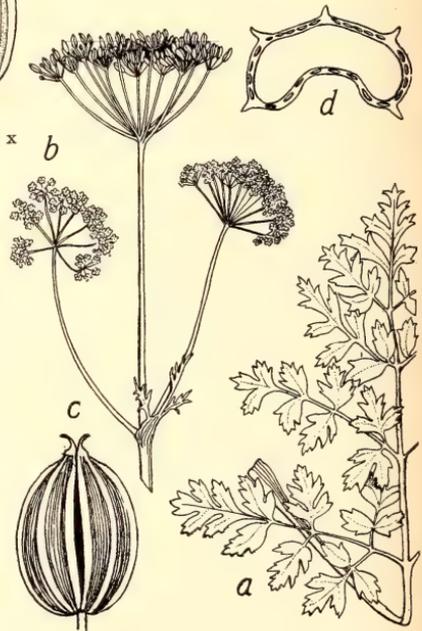


23. *Ligusticum apiodorum* C. & R.; a, leaf x $\frac{1}{2}$; b, fr. umbel x $\frac{1}{2}$; c, fr. x 5; d, sect. carp. x 10.

Proc. Am. Acad. 7:345 (1868), type loc. "rocky hills along the coast of Cal. from Mendocino Co. to San Francisco," Bolander; Jepson, Fl. W. Mid. Cal. 353 (1901).

L. CALIFÓRNICUM C. & R. Contrib. U. S. Nat. Herb. 7:132 (1900), type loc. Covelo, Mendocino Co., Chesnut; resembling *L. apiodorum*; ribs of the fruit filiform (ex char.).

2. *L. grayi* C. & R. Fig. 24. Plants 1 to $2\frac{1}{2}$ ft. high, glabrous, the stems 1 or 2 from a stout fibrous-coated caudex, not leafy or with one much reduced leaf; leaves basal, once or twice ternate, then pinnate with 5 or 7 leaflets, the leaflets ovate in outline, incised, parted or divided, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; flowers white; bractlets linear-setaceous, few or none; fruiting rays 1 to $2\frac{1}{2}$ in. long; pedicels 2 to 3 lines long; fruits 2 lines long, the ribs very narrowly winged; oil tubes 3 to 6 in the intervals, 4 to 8 on the commissure.—Montane, 4000 to 10,200 ft.: Sierra Nevada north to Modoc Co.; inner North Coast Range (Mendocino Co. to Siskiyou Co.).



24. *Ligusticum grayi* C. & R.; a, leaf x $\frac{3}{8}$; b, umbels x $\frac{1}{2}$; c, fr. x 5; d, sect. carp. x 9.

Loes.—Farewell Gap, *Jepson* 1149; Mineral King, *Jepson* 1033; Alta Mdws., Tulare Co., *K. Brandegee*; Mt. Silliman, *K. Brandegee*; Chilnualna Creek, *Congdon*; Peregoy Mdw., Yosemite Park, *Jepson* 5640a; Rodgers Lake to Muir Lake, *Jepson* 3386; Stanislaus Peak, *A. L. Grant* 530; Ostrander Mdws., Yosemite Park, *Bolander* 6341; Piute Mt., Tuolumne Co., *Jepson* 4582; Soda Springs Cañon, Kennedy Lake, *A. L. Grant* 472; Silver Lake, Amador Co., *E. Mulliken*; Ebbetts Pass, Alpine Co., *Brewer* 2082; Silver Creek, Eldorado Co., *Kennedy* 21, 95, 95a, 181; Deer Park, Placer Co., *C. J. Fox*; Mt. Tallac, *Jepson* 8155; Placer Co., *Carpenter*; Summit, Nevada Co., *Jepson*; Webber Lake, *Lemmon*; Mill Creek Mdw., Warner Mts., *L. S. Smith* 985; Mt. Bidwell, *Jepson* 7884; Shackelford Creek, near Quartz Valley, *Butler* 459; South Yollo Bolly, *Jepson*.

Refs.—LIGUSTICUM GRAYI C. & R. Rev. N. Am. Umbell. 88 (1888). *L. apiifolium* Brew. & Wats. Bot. Cal. 1:264 (1876). *L. apiifolium* var. *minus* Gray, Brew. & Wats. Bot. Cal. 1:264 (1876), type loc. Ostrander's Mdws., near Yosemite, *Bolander* 6341, is a somewhat smaller form, especially Ebbetts Pass, Alpine Co., *Brewer* 2082. *L. cusickii* C. & R. Contrib. U. S. Nat. Herb. 7:138 (1900), type loc. higher mts. of e. Ore., *Cusick* 1799. *L. pringlei* C. & R. l. e., type loc. Siskiyou Co., *Pringle* 19.

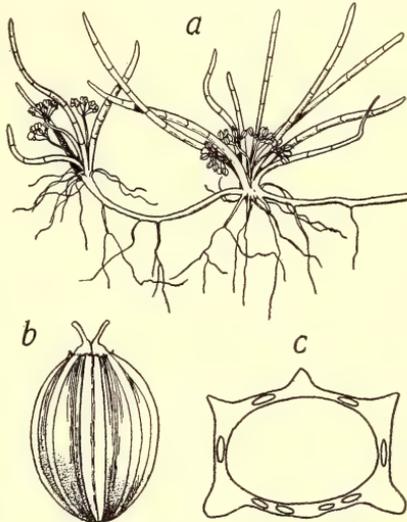
24. LILAEÓPSIS Greene.

Small glabrous perennials. Stems fistulose, creeping and rooting in the mud, only the leaves and short peduncles erect. Leaves reduced to hollow cylindrical petioles jointed by transverse partitions. Flowers dull white or slightly tinged with pinkish brown, in a few-flowered simple umbel. Bracts of the involucre minute. Fruit subglobose. Dorsal ribs filiform, the lateral corky and thickened next to the commissure. Oil tubes solitary in the intervals (rarely 2), 2, 4 or 6 on the commissure. (Named for its resemblance to *Lilaea*.)

1. *L. lineata* (Michx.) Greene, var. *occidentalis* *Jepson* n. comb. Fig. 25. Leaves 1 to 8 in. long, 1 to 2 lines wide; peduncles 1 in. long or less; fruiting pedicels $1\frac{1}{2}$ to 3 lines long; petals plane; fruit 1 line long.—Salt marshes or brackish mud flats along the coast from Marin Co. to Humboldt Co.; north to Alaska.

Locs.—Suisun Bay, s. shores (acc. *K. Brandegee*); Abbotts Lagoon, Pt. Reyes, *Jepson* 1165; Bodega Head, *K. Brandegee*; Samoa, Humboldt Co., *Tracy* 3102; Stone Lagoon, Humboldt Co., *Jepson* 9333.

Refs.—LILAEOPSIS LINEATA Greene, Pitt. 2:192 (1891); var. OCCIDENTALIS *Jepson*. *L. occidentalis* C. & R. Bot. Gaz. 24:48, fig. 2 (1897), type loc. Yakima Bay, Ore., *Hall* 205; Contrib. U. S. Nat. Herb. 7:123, fig. 37 (1900). *L. lineata* *Jepson*, Fl. W. Mid. Cal. ed. 2, 298 (1911). *Crantzia lineata* *Jepson*, Fl. W. Mid. Cal. ed. 1, 353 (1901).



25. *Lilaeopsis lineata* Greene var. *occidentalis* *Jepson* n. comb.; a, habit x $\frac{1}{2}$; b, fr. x 12; c, sect. carp. x 18.

25. PODÍSTERA Wats.

Dwarf perennial, the stems short and shortly branched, forming a mat-like plant. Leaves once or twice pinnately parted. Umbels compound but very much condensed. Involucre none. Involucels of 3 to 5-cleft green bractlets.

Flowers white or pinkish. Calyx teeth prominent. Styles ribbon-like. Fruit flattened laterally, elliptic-ovate. Ribs slender. Oil tubes 2 or 3 in the intervals, 6 on the commissure. (Greek podos, foot, and stereos, solid, referring to the compactly involved pedicels and involucls.)

Leaves pinnately parted.....1. *P. nevadensis*.
Leaves bipinnately parted.....2. *P. albensis*.

1. *P. nevadensis* (Gray) Wats. Peduncles arising from the short crowded branches, $\frac{3}{4}$ to $1\frac{1}{2}$ in. high; herbage obscurely puberulent; leaves pinnately parted, 4 to 9 lines long, the 5 to 7 segments narrowly oblong, acute, entire, 1 to 3 lines long, the petioles with membranous sheaths; flowers yellow; umbels very much condensed; fruit 1 to $1\frac{1}{4}$ lines long.—Alpine, 11,600 to 13,000 ft., on high peaks of the Sierra Nevada in Tuolumne and Mono Cos.

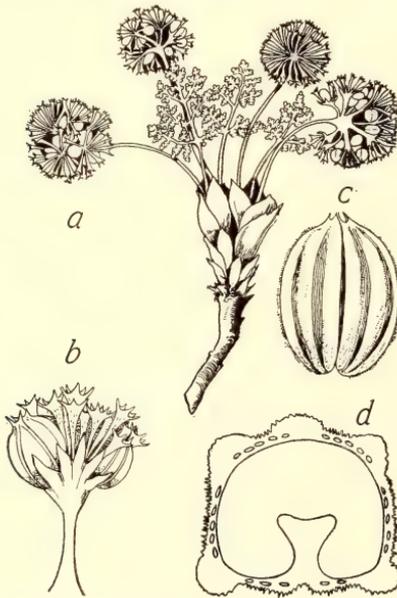
Locs.—Mt. Dana, Brewer, Lemmon, Congdon, Jepson 3291, 3312, H. M. Evans; Mt. Warren, Congdon. It is found mostly within the limits of an 800-foot zone. The plants form closely woven circular mats often one foot in diameter, with the flowers scarcely rising above the foliage.

Refs.—*PODISTERA NEVADENSIS* Wats. Proc. Am. Acad. 22:475 (1887).
Cymopterus nevadensis Gray, Proc. Am. Acad. 6:536 (1865), type loc. Mt. Dana, Brewer.

2. *P. albensis* Jepson n. sp. Similar to *P. nevadensis*; plants 1 to $2\frac{1}{4}$ in. high; leaves bipinnatifid, the oblong segments 1 to 2 lines long.—Rocks, White Mts., Inyo Co., 7000 to 8000 ft. (Purpus 5831, type).

26. OREONANA Jepson nov. gen.

Low tufted grayish plants, the peduncles and leaves from the root-crown of a stout tap-root. Herbage woolly or roughish pubescent. Leaves ternately compound and finely dissected, the segments crowded, callous-margined and cuspidate.



26. *Oreonana californica* Jepson; a, habit x $\frac{1}{2}$; b, umbellet x $2\frac{1}{2}$; c, fr. x 4; d, sect. carp. x 12.

Flowers white, in compound umbels, the umbels much condensed or capitate. Rays about 10 to 15. Calyx teeth present, often conspicuous. Involucre none. Involucels unilateral. Fruit broadly elliptic or orbicular, somewhat laterally compressed, sessile. Ribs filiform. Sterile flowers on filament-like pedicels which are longer than the rays. Oil tubes 3 to 5 in the intervals, 3 or 4 or 6 on the commissure. (Greek oreos, mountain, and nannos, dwarf, these plants very small as compared with the *Velaes* from which they are separated.)

Rays membranously winged and web-footed; sterile pedicels equaling or little exceeding the fruit; calyx teeth of sterile flowers very conspicuous, star-like.....1. *O. californica*.
Rays not winged; sterile pedicels greatly exceeding the fruit; calyx teeth inconspicuous.....2. *O. vestita*.

1. *O. californica* Jepson n. sp. Fig. 26. One to 3 in. high; blades, pedicels and fruits with a short stiff spreading pubescence, the plant otherwise glabrous; peduncles equaling or little exceeding the leaves; umbel globose-capitate; involucels 5-lobed, the lobes ovate-acuminate; rays membranously winged and web-footed at base, very short (1 to 2 lines long); fruit densely white-pubescent when young, greyish in age, sessile, globose,

the calyx teeth evident; pedicels of sterile flowers equaling or only slightly exceeding the fruit; oil tubes 3 to 5 in the intervals, 4 (or 3) on the commissure; calyx teeth of sterile flowers very conspicuous, star-like.—Upper Kern River basin, 6000 to 12,000 ft.

Locs.—Harrison Pass, *Jepson* 5036; Mt. Whitney, *Purpus* 1479; mts. betw. Soda Creek and Little Kern River, *Purpus* 1769; Whitney Mds., *Hall & Babcock* 5469; Ramshaw Mds., *Jepson* 4966 (type); Kern Peak, *Mary Haskell*.

2. *O. vestita* *Jepson* n. comb. Plants 2 to 4 in. high, clothed with a dense soft-silky pubescence; umbels condensed but still umbellate in form, equaling or mostly raised above the leaves; involuclers of lanceolate 3 to 5-lobed bractlets; rays 6 to 10 lines long, not winged; sterile pedicels 4 to 6 lines long, greatly exceeding the fruit; fruit sessile or nearly so, ovate-oblong, soft-pubescent, 2 lines long; oil tubes 3 or 4 in the intervals, 3 on the commissure; calyx teeth of sterile flowers evident but not conspicuous.—San Gabriel and San Bernardino mountains, 6500 to 10,000 ft. Rare.

Locs.—Summit of Mt. San Antonio, *Charlotte Wilder*; summit of North Baldy, *Peirson* 137; Bear Valley, *Parish*.

Refs.—OREONANA VESTITA *Jepson*. *Deweya vestita* *Wats.* Proc. Am. Acad. 17:374 (1882), type loc. summit of Mt. San Antonio (Baldy), *S. B. & W. F. Parish*; *Wats.* l. c. 22:415 (1887). *Velaea vestita* *C. & R.* Rev. N. Am. Umbell. 122 (1888). *Drudeophytum vestitum* *C. & R.* Contrib. U. S. Nat. Herb. 7:83 (1900).

27. VELAËA DC.

Subglabrous perennials with thick yellow elongated odoriferous taproots. Leaves mostly basal, pinnately or ternately compound. Ours usually without involucre, the involuclers in our species of few small lanceolate bracts. Flowers yellow, in compound umbels. Fruit oblong or orbicular, somewhat laterally compressed, with acute or filiform equal ribs. Oil tubes conspicuous, 3 to 6 in the intervals, 4 to 10 on the commissure. Seed-face strongly involute, inclosing a central cavity. (*Sebastin Eugene Vela*, student of the Umbelliferae.)

Leaves simply pinnate; ribs of the carpel prominent.—Subgenus DEWEYA..

1. *V. arguta*.

Leaves ternate; ribs of carpel filiform, slender or inconspicuous.—Subgenus DRUDEOPHYTUM.

Ultimate leaf segments 1 to 2 in. long; bractlets conspicuous, often exceeding the umbellet; fruit 3 to 4 lines long.....

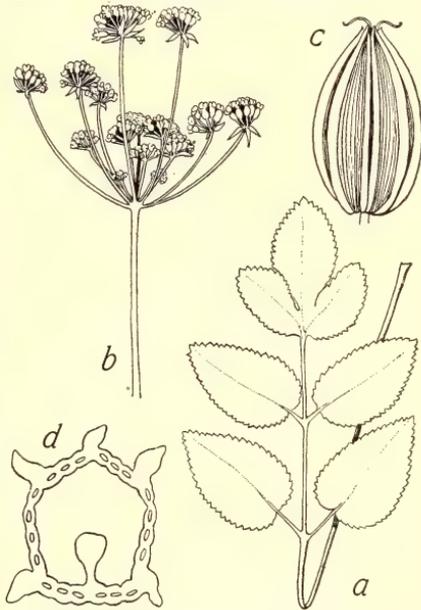
2. *V. hartwegii*.

Ultimate leaf segments usually less than 1 in. long; bractlets inconspicuous, shorter than the umbellets.

Calyx teeth obsolete; fruit nearly orbicular, 1 to 2 lines long, as broad or nearly as broad. 3. *V. kelloggii*.

Calyx teeth evident; fruit oblong, 2 to 3 lines long.....

4. *V. parishii*.



27. *Velaea arguta* *C. & R.*; a, leaf x ½; b, umbel x ½; c, fr. x 3; d, sect. carp. x 8.

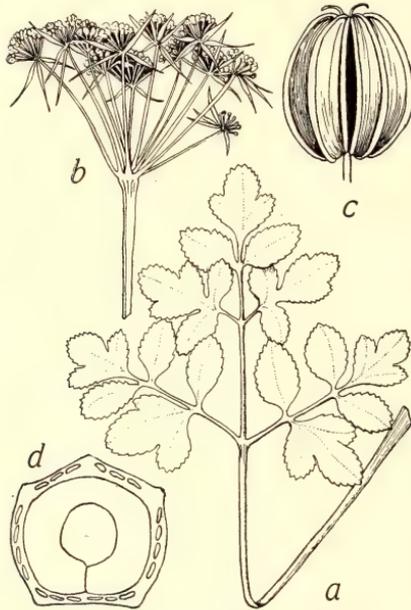
1. *V. arguta* (*Nutt.*) *C. & R.* Fig. 27. Plants 1 to 2½ ft. high, the leaves simply pinnate, 2 to 5 in. long, on petioles about 1½ times as long; leaflets 5 to 7, ovate, finely and sharply serrate, 1 to 2 in. long; the lowest often

petiolulate; terminal and lowest leaflets often subcordate and often 3-lobed; rays 12 to 20, $1\frac{1}{2}$ to 3 (or 5) in. long; pedicels 1 to 4 lines long; involucre mostly none; involucels of few linear acuminate bractlets; fruit oblong, 4 lines long; ribs acute, prominent; oil tubes 3 to 5 in the intervals, 4 to 6 on the commissure.—Mountains of coastal Southern California and Lower California.

Locs.—Santa Barbara, *K. Brandegee*; Echo Mt., *Peirson* 134; San Bernardino foothills, *Parish* 4470; Warren's Ranch, e. San Bernardino Mts., *T. Brandegee*; Chalk Hill, San Jacinto Mts., *Hall* 2083; Ramona, *T. Brandegee*.

Refs.—VELAEA ARGUTA C. & R. Rev. N. Am. Umbell. 120 (1888). *Deweya arguta* T. & G. Fl. 1:641 (1840), type loc. San Diego, *Nuttall*; C. & R. Contrib. U. S. Nat. Herb. 7:79, fig. 14 (1900). *Ligusticum argutum* Nutt. T. & G. Fl. 1:641 (1840), type loc. San Diego, *Nuttall*. *Arracacia arguta* Wats. Bibl. Index. N. Am. Plants 419 (1878).

2. *V. hartwegii* (Gray) C. & R. Fig. 28. Plants mostly tufted, 1 to 3 ft.



28. *Velaea hartwegii* C. & R.; a, leaf $\times \frac{1}{2}$; b, umbel $\times \frac{1}{2}$; c, fr. $\times 3$; d, sect. carp. $\times 6$.

high, the peduncles and leaves from a shortly branched caudex; peduncles and petioles somewhat scabrous; leaves biternate, or partly triternate, the ultimate lateral divisions mostly 3-foliolate, the ultimate middle divisions mostly 5 or 7-foliolate; leaflets ovate or oblong, sparingly incised, serrate, mucronate, $\frac{3}{4}$ to 2 in. long, or the leaflets often more or less confluent; petioles 2 to 6 in. long; rays about 15, 2 to 4 in. long in fruit; bracts none; bractlets 3 to 6, unequal, linear-lanceolate, long-pointed, exteriorly disposed, mostly surpassing the umbellets; fruit nearly orbicular, 3 to 4 lines long; ribs slender but rather prominent; oil tubes 3 (or 4 to 6) in dorsal intervals, 3 or 4 (to 6) in laterals, 6 (in sets of 3) or 9 on the commissure.—Foot-hills: Sierra Nevada, 2000 to 5000 ft. from Tulare Co. to Butte Co.; South Coast Ranges from Ventura Co. to Contra Costa Co., mostly 1000 to 2000 ft. Apr. Widely distributed but somewhat rare locally.

Locs.—Sierra Nevada: South Fork Keweah River above Clough Cave; *Jepson* 4655; Pine Ridge, Fresno Co., *Hall & Chandler* 310; Collins Mdw., Fresno Co., *Hall & Chandler* 531; Benton Mills, Mariposa Co., *Congdon*; Hazel Green, Coulterville road to Yosemite, *Jepson*; Amador Co., *Hansen* 900; Little Chico Creek, *R. M. Austin*. South Coast Ranges: Ojai Valley, *F. W. Hubby*; Cuyama, *Eastwood*; Estrella, *L. Jared*; Arroyo Grande, *Alice King*; Loma Prieta, *Davy* 640; Morrison Cañon, Niles, *Jepson*; Berkeley, *Jepson*; Mt. Diablo, *Greene*.

Refs.—VELAEA HARTWEGII C. & R. Rev. N. A. Umbell. 121 (1888); C. & R. Contrib. U. S. Nat. Herb. 7:81, fig. 15 (1900); *Jepson*, Fl. W. Mid. Cal. 350 (1901). *Deweya hartwegi* Gray, Proc. Am. Acad. 7:342 (1868), type loc. n. Sierra foothills, *Hartweg* 1748; *Jepson*, Erythra, 5:55 (1897). *Drudeophytum hartwegi* C. & R. Contrib. U. S. Nat. Herb. 7:81 (1900).

3. *V. kellöggii* (Gray) C. & R. Plants erect, $\frac{3}{4}$ to $2\frac{3}{4}$ ft. high; flowering stems leafless or with a single leaf only; leaves basal, 1 to 2 or 3 times ternate; leaflets ovate or roundish, sharply serrate and more or less incised or lobed,

mostly $\frac{1}{2}$ to 1 in. long; fruiting rays 2 to 4 in. long, or in fruit 3 to 4 in. long; pedicels 2 to 4 lines long; fruit nearly orbicular, 1 to 2 lines long, nearly as broad as long or a little broader, somewhat notched at base; ribs filiform; oil tubes 3 in the dorsal intervals, 5 to 6 in the laterals, 8 to 10 on the commissure.—Cañons in the foothills: Coast Ranges from Humboldt Co. to Contra Costa Co., 500 to 1500 ft.: northern Sierra Nevada foothills from Sacramento Co. to Butte Co., 1000 to 3500 ft. Rather rare.

Locs.—Pilareitos Cañon, San Mateo Co., *Davy*; Mt. Tamalpais, *Jepson*; Comptche, Mendocino Co., *Harriett Walker* 274; Maple Creek, Mad River, *Tracy* 2607; Willow Creek, Trinity River, *Tracy* 3289; Stirling, Butte Co., *Heller* 10811.

Refs.—VELAEA KELLOGGII C. & R. Rev. N. A. Umbell. 121 (1888); *Jepson* Fl. W. Mid. Cal. 350 (1901). *Deweya kelloggii* Gray, Proc. Am. Acad. 7:343 (1868), type loc. Bolinas Bay, *Kellogg*; Wats. Proc. Am. Acad. 22:415 (1887). *Drudeophytum kelloggii* C. & R. Contrib. U. S. Nat. Herb. 7:81 (1900).

4. **V. parishii** C. & R. Plants erect, short ($\frac{1}{2}$ to $1\frac{1}{2}$ ft. high), with mostly basal leaves; herbage glabrous throughout; leaves $\frac{1}{2}$ to $\frac{1}{3}$ as long as flowering stems, thickish, bipinnate, the segments ovate, irregularly incised or cuspidate-toothed, 4 to 7 lines long; rays 14 to 20, 1 to $2\frac{1}{4}$ in. long; pedicels 2 to 3 lines long; pedicels of sterile flowers often equaling the fruit; involucre none; involucels of a few setaceous bractlets; calyx teeth prominent; fruit oblong, 2 to 3 lines long; oil tubes 3 or 4 in the intervals, 4 or 5 on the commissure.—Mountains of Southern California and northerly to the Sierra Nevada of Kern and Tulare Cos., 4000 to 8000 ft.

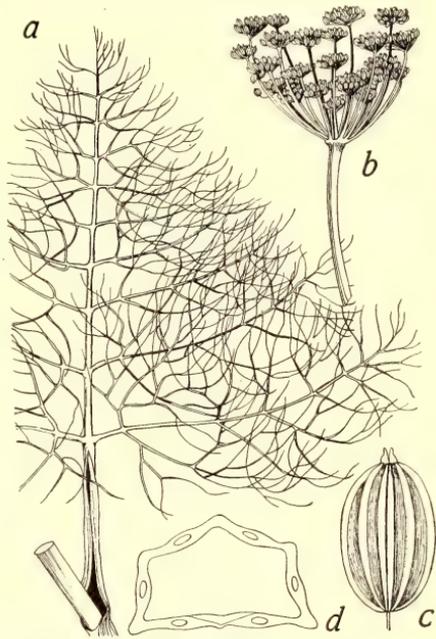
Locs.—Santa Rosa Mt., *Jepson* 1441; Strawberry Valley, Mt. San Jacinto, *Hall* 2508; Cushenberry Cañon, San Bernardino Mts., *Parish* 2379; Mt. Wilson, *Davidson*; Mt. Lowe, *Peirson* 136; Bitter Creek, Mt. Pinos, *Hall* 6633; Greenhorn Range (e. slope), *Hall & Babcock* 5082; Pah Ute Peak, *Purpus* 5339; Lloyd Mdws., Kern River, *Jepson* 4901; Cottonwood Creek near Timosea Peak, Inyo Co., *Jepson* 5085.

Refs.—VELAEA PARISHII C. & R. Rev. N. Am. Umbell. 121 (1888), type loc. San Bernardino Mts., *Parish* Bros. 1827. *Drudeophytum parishii* C. & R. Contrib. U. S. Nat. Herb. 7:82 (1900).

28. FOENÍCULUM Hill.

Stout glabrous perennial with dark green aromatic herbage. Leaves decomposed, dissected into numerous filiform segments. Flowers yellow, in large compound umbels. Involucre and involucels none. Calyx teeth obsolete. Fruit oblong, the ribs prominent. Oil tubes solitary in the intervals, 2 on the commissure. (Diminutive of Latin foenum, hay, from its odor.)

1. **F. vulgare** (L.) Gaertn. SWEET FENNEL. Fig. 29. Stem striate, branching, 3 to 7 ft. high; herbage glaucous; rays $\frac{1}{2}$ to $2\frac{1}{2}$ in. long; fruit $1\frac{1}{2}$ to 2 lines long.—Naturalized from Europe, frequenting waste places on old farms and by country lanes; flowering in summer.



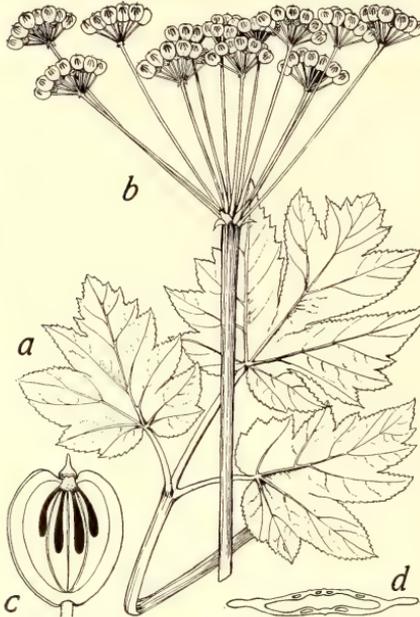
29. *Foeniculum vulgare* Gaertn.; a, leaf x $\frac{1}{4}$; b, umbel x $\frac{1}{4}$; c, fr. x 5; d, sect. carp. x 10.

Loes.—Lake Co., *P. E. Goddard* in 1901; Sacramento, *Bioletti*; Vacaville; Cordelia, *Jepson* 9064; St. Helena, *Jepson* in 1895; Berkeley; Berryessa, Santa Clara Co., *Davy* 7058; Monterey; San Luis Obispo, *Jepson*; Los Angeles (*Erythra* 1.59).

Refs.—*FOENICULUM VULGARE* Gaertn. *Fruct. & Sem.* 1:105, pl. 23, fig. 5 (1788); *Jepson*. *Fl. W. Mid. Cal.* 354 (1901). *Anethum foeniculum* L. *Sp. Pl.* 263 (1753), type European.

29. HERACLEUM L.

Tall perennials with stout stems from thick horizontal rootstocks. Leaves very large, ternately compound, with broad sheathing petioles. Flowers white, in a large many-rayed compound umbel. Involucre deciduous. Involucels of numerous bractlets. Petals obovate, the marginal ones of the umbel much larger. Fruit almost round, strongly compressed. Lateral ribs with a thin wing; dorsal and intermediate ribs filiform. Oil tubes 2 on the commissure, 1 in each interval, visible from the summit to about the middle of the carpels. (Named for Hercules, who, it is said, first used it in medicine.)



30. *Heracleum lanatum* Michx.; a, leaf $\times \frac{1}{8}$; b, umbel $\times \frac{1}{4}$; c, carp. $\times 2$; d, sect. carp. $\times 3$.

1. *H. lanatum* Michx. Cow PAR-SNIP. Fig. 30. Plants 4 to 5 ft. high; leaflets 3, petiolulate, ovate or orbicular, sharply serrate and lobed, 3 to 6 in. broad; umbels 6 to 10 in. broad; fruit $3\frac{1}{2}$ to 5 lines long.—Common in brushy cañons or on north slopes: Coast Ranges near the sea, middle altitudes in the Sierra Nevada, and high mountains of Southern California. North to Alaska and east to the Atlantic. Reputed poisonous to cattle.

Loes.—Coast Ranges: Carlotta, Humboldt Co., *Tracy* 4511; Inverness, *Jepson*; Berkeley, *Jepson*; Oakland Hills, *Jepson* 5716; Half-moon Bay, *Jepson*; Monterey, *Jepson*. Sierra Nevada: Ft. Bidwell, *Manning*; Tallac, *C. J. Fox*; Kennedy Lake, Tuolumne Co., *A. L. Grant* 240; Yosemite, *Jepson*; Simpson Mdw., Middle Fork Kings River, *Henrietta Eliot*; Southern California: Little Bear Valley, San Bernardino Mts., *Parish* 1668; San Jacinto Mts. (*Univ. Cal. Publ. Bot.* 1:98).

Refs.—*HERACLEUM LANATUM* Michx. *Fl. Bor. Am.* 1:166 (1803), type from Canada; *C. & R. Contrib. U. S. Nat. Herb.* 7:248, fig. 64 (1900); *Jepson*, *Fl. W. Mid. Cal.* 360 (1901).

30. LEPTOTAËNIA Nutt.

Tall stoutish perennials, with thick fusiform roots and ternately or pinnately compound leaves. Flowers yellow or purple, in compound umbels. Involucre of few bracts or none. Involucels of several small bractlets or none. Fruit oblong to suborbicular, strongly compressed. Lateral ribs with broad corky-thickened wings coherent until maturity. Dorsal and intermediate ribs filiform and approximate. Oil tubes 1 to 8 in the intervals, 2 to 10 on the commissure or

obscure and apparently none. (Greek leptos, narrow, and tainia, vittae or oil tubes.)

Stems leafy below; leaves large, the ultimate segments short.

Leaves glabrous; oil tubes present. 1. *L. californica*.

Leaf margins and veins puberulent beneath; oil tubes none. 2. *L. dissecta*.

Peduncles and leaves from the root-crown; leaflets smaller, glabrous, the segments linear, elongated or grass-like.

Bracts obovate; wings thicker than the body of the fruit. 3. *L. anomala*.

Bracts lanceolate, entire; wings not so thick as the body of the fruit. 4. *L. humilis*.

1. *L. californica* Nutt. Erect, 2 to 4 ft. high, glabrous, glaucous; leaves once or twice ternate, then pinnate; leaflets 1 to 2 in. long or more, cuneate-orbicular or -obovate, 3-lobed or the terminal 3-parted, serrate above; peduncles at summit abruptly widened into a disk-like dilatation; rays subequal, 2 to 3 in. long; bracts none; fruiting pedicels 3 to 9 lines long; bractlets few or none; fruit elliptical, narrowly winged, 4 to 6 lines long; oil tubes 6 to 10 on the commissure (the lateral frequently anastomosing), 3 or 4 in the intervals or sometimes obscure.—Coast Ranges, 1000 to 3000 ft., north to Siskiyou Co. and southern Oregon, south to Santa Barbara Co. and Kern Co.

Locs.—Pah Ute Peak, *Purpus* 5092; Calaveras Valley, Alameda Co., *K. Brandegee*; Mt. St. Helena, *Barber* 2602; Calistoga, *Jepson*; Vaca Mts., *Jepson*; Potter Valley, Mendocino Co., *Purpus*; Ft. Seward Ridge, s. Humboldt Co., *Jepson* 1892a; ridge betw. Van Duzen and Mad Rivers, *Tracy* 2905; Yreka, Siskiyou Co., *Butler* 799. Keno, Klamath River, s. Ore., *Cusick* 2837.

Refs.—LEPTOTAENIA CALIFORNICA Nutt.; T. & G. Fl. N. Am. 1:630 (1840), type loc. Santa Barbara, *Nuttall*; *Jepson*, Fl. W. Mid. Cal. 356 (1901). Var. *platycarpa* *Jepson*, *Erythraea* 1:8 (1893), type loc. Gates Cañon, Vaca Mts., *Jepson*. Var. *dilatata* *Jepson*, *Erythraea* 1:63 (1893), type loc. Elk Ridge, Mendocino Co., *Bolander* 6526.

2. *L. dissecta* Nutt. Plants 1½ to 2¾ ft. high, leafy at base; leaves broad, 2 or 3 times ternate and then once or twice pinnate, the segments incised-pinnatifid; ultimate segments linear-oblong, 1 to 2 lines long; peduncles 1 to 2 ft. long; fruiting rays 2 to 4½ in. long; involucre of few bracts or none; involucre of several lanceolate bractlets; flowers yellow or purplish; fruit oblong, 5 to 9 lines long, sessile or on pedicels 1 line (rarely to 3 lines) long; dorsal and intermediate ribs filiform or sometimes obscure; oil tubes none or very obscure.—Open wooded slopes: Coast Ranges from Mendocino Co. to Siskiyou Co., thence south in the Sierra Nevada to Mariposa Co. Northward to British Columbia. Apr.-June.

Locs.—Buck Mt., Humboldt Co., *Tracy* 4237; Hupa, *Chandler* 1340; Dyers Ranch to Hawkins Bar, Trinity Co., *Jepson* 1996; Yreka, *Butler* 1303 (pedicels 1½ to 2 lines long); Fall River Sprs., ne. Shasta Co., *Hall & Babcock* 4206 (pedicels as in *Butler* 1303); Agua Fria, Mariposa Co., *Congdon* (foliage resembling var. *multifida*). The three last cited spms. represent intergrades to var. *multifida*.

Var. MULTIFIDA *Jepson* n. comb. Leaves dissected into linear segments 2 to 4 lines long; fruiting pedicels 3 to 7 lines long; fruit 5 to 7½ lines long; seed face concave.—Montane, 3500 to 8000 ft., Sierra Nevada from Nevada Co. to Kern Co., south to Southern California. Eastward to New Mexico and Montana.

Locs.—Truckee, *Sonne*; Kennedy's Lake, Tuolumne Co., *A. L. Grant* 245, 211; Tehachapi Mts., *Jepson* 7422; Andrews Camp, Inyo Co., *K. Brandegee*; Indian Cañon, San Rafael Mts., *Hall* 7807; Lytle Creek, San Antonio Mts., *Hall* 1430.

Refs.—LEPTOTAENIA DISSECTA Nutt.; T. & G. Fl. N. Am. 1:630 (1840), type loc. mouth of the Willamette River, *Nuttall*; *Jepson*, Fl. W. Mid. Cal. 357 (1901). *Ferula dissecta* Gray, Proc. Am. Acad. 7:348 (1868). *Ferula dissoluta* Wats. Bot. Cal. 1:271 (1876). Var. MULTIFIDA *Jepson*. *L. multifida* Nutt.; T. & G. Fl. 1:630 (1840), plains of the Columbia River east of Walla Walla and in the Blue Mts., *Nuttall*; C. & R., Contrib. U. S. Nat. Herb. 7:198, fig. 59 (1900).

3. *L. anomala* C. & R. Plants 10 to 12 in. high, glabrous throughout; leaves

all basal, ternate, then pinnate, the divisions few, distant, very narrowly linear, $\frac{1}{2}$ to 3 in. long; peduncles arising from the root-crown, slender, 6 to 8 in. high; rays 3 to 6, unequal, $\frac{1}{4}$ to 3 in. long in fruit; pedicels about 1 line long, the umbellets in fruit forming a compact cluster; involucre none; involuclcs conspicuous, the bractlets prominent, obovate, scarious-margined, veiny, toothed near the apex, more or less united; fruit elliptic to oblong, 3 to 4 lines long, the lateral ribs corky thickened (much thicker than the body), the others filiform; tubes none or inconspicuous.—Sierra Nevada foothills in Amador Co. (Carbondale).

Ref.—LEPTOTAENIA ANOMALA C. & R. Rev. N. Am. Umbell. 53 (1888), type loc. Carbondale, Amador Co., *Curran*.

4. *L. humilis* C. & R. Like *L. anomala*; bractlets linear to lanceolate, entire; wings of the fruit corky-thickened but not as thick as the body.—Butte Co., plains near Little Chico Creek. This simulates *Lomatium marginatum* C. & R.

Var. DENTICULATA Jepson n. var. Wings of the fruit with denticulate margins; intervals commonly with about 3 longitudinal striae.—Blue Ravine, Eldorado Co., *K. Brandegee* (type).

Refs.—LEPTOTAENIA HUMILIS C. & R. Contrib. U. S. Nat. Herb. 7:200 (1900), type loc. plains near Chico, *Bruce* 2661. Var. DENTICULATA Jepson.

31. LOMATIUM Raf. HOG-FENNEL.

Low perennials, mostly of dry ground, with thick roots. Stems usually several from the root crown, naked or few leaved. Leaves decomposed, often dissected, wholly basal or sometimes partly sub-basal. Flowers white or yellow, rarely purple, in compound umbels. Involucre none (a few species sometimes with 1 to 3 bracts). Involucels usually present. Fruit roundish to broadly or narrowly oblong, much compressed. Lateral ribs winged, the wings of the companion carpels coherent until maturity. Stylopodium wanting or not obvious in the fruit. Oil tubes 1 to 4 in the intervals, 2 to 6 on the commissure. (From Greek *loma*, a border, referring to the winged fruit.)

I. Stems from a taproot.

A. PEDUNCLES NOT ENLARGED AT SUMMIT.

a. Fruit notched more or less deeply at each end, so that the wings on each side the body are more or less distinct; leaves with the leaflets more or less broad in outline.—Subgenus EURYPTERA.

Leaves ternate, leaflets entire or merely toothed; coastal S. Cal. 1. *L. lucidum*.
Leaves bipinnate, the leaflets ovate in outline, but usually much incised; South Coast Ranges 2. *L. parvifolium*.

b. Fruit not notched or scarcely so, the wings more or less joined above and below the body of the seed.

Leaves decomposed, dissected into numerous very small segments.

Leaves ternate or quinate, broad or roundish in outline.—Subgenus EULOMATIUM.

Bractlets present.

Bractlets broad, roundish, or obovate; leaves ternate, then pinnately dissected; flowers yellow; widely distributed species.

Oil tubes none in the intervals or indistinct; wings of fruit narrower than body, thickish 3. *L. caruifolium*.

Oil tubes solitary in the intervals; wings of fruit thin.

Wings broader than body; body situated mostly above middle of fruit 4. *L. vaseyi*.

Wings equaling the body in breadth or narrower than body; body situated about middle of fruit 5. *L. utriculatum*.

Bractlets narrow, most often lanceolate.

Bractlets not scarious-margined, often more or less united and unilateral.

Fruit glabrous; corolla glabrous; widely distributed species 6. *L. macrocarpum*.

Fruit pubescent; corolla with kinky white hairs.

Pedicels mostly $\frac{1}{2}$ in. or more long; wings of the fruit broad, membranous, thinly pubescent; Coast Ranges 7. *L. dasycarpum*.

Pedicels mostly less than $\frac{1}{2}$ in. long; wings of the fruit narrower, somewhat thickened, tomentose.

(Continued on page 149)

California Botanical Society

Schedule of Field Trips and Meetings

September, 1923 to January, 1924

- SUNDAY, SEPT. 16. Newark, for study of marsh flora. Take 9 a. m. train from First Street and Broadway, Oakland, returning 4 p. m. Round trip to Newark, \$1.00. Leader, Dr. W. C. Blasdale.
- SUNDAY, SEPT. 30. Meeting with Mt. Tamalpais Conservation Club. Take 8:15 a. m. Sausalito boat and train to Mill Valley. Walk by stair and railroad track to West Point, thence by Willow Camp trail to Boot Jack No. 2. Meeting of Conservation Club at 1:30 p. m. Leader, Mrs. Adeline Frederick.
- SUNDAY, OCT. 14. Mt. Davidson. Meet at entrance of upper waiting room of San Francisco ferry building, 9 a. m. Take car K to end of Twin Peaks Tunnel. Leader, Mr. Fred W. Koch.
- SUNDAY, OCT. 28. Dimond Cañon. Meet at 13th Street and Broadway, Oakland, 9 a. m. Take car marked "Dimond." Leader, Miss Amy Rinehart.
- SUNDAY, NOV. 11. Rockridge, for study of mushrooms. Meet at end of Rockridge car line, Oakland, at 9:30 a. m. Leader, Mr. A. L. Walker.
- SUNDAY, NOV. 25. Home of Mrs. Dudley Baird, 2436 Prospect Street, Berkeley; mounted specimens of plants collected on Mt. Dana. Take College Avenue car to Dwight Way, walk four blocks east to Prospect Street. Time, 2:30 to 5.
- SUNDAY, DEC. 9. Golden Gate Park, San Francisco, for study of conifers and native shrubs. Meet at Haight Street entrance, 10 a. m. Leader, Miss Muriel Pettit.
- THURSDAY, DEC. 13, 8 p. m. 212 Wheeler Hall. Lecture by J. B. Davy on plants of South Africa. The public is invited.
- SUNDAY, JAN. 13. Hayward Cañon. Meet at 13th Street and Broadway, Oakland, 9:30 a. m. Take Hayward car to end of line. Leader, Miss Edna Finley.



Amendments to the Constitution

Members will send in their votes by postcard to the Assistant Secretary, Mrs. Adeline Frederick, 1201 Henry Street, Berkeley, on the following amendments:

Art. VI, Sec. 2. The regular meeting in January shall be observed as the Annual meeting.

Art. VI, Sec. 4. Field trips shall be for members and their guests.

MADROÑO

JOURNAL OF THE
CALIFORNIA BOTANICAL
SOCIETY



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January, 1924

MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY

The purpose of this Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora, and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographical distribution of the native plants will be especially welcome.

Back numbers of the Journal may be had from the Assistant Secretary,

MRS. ADELINE FREDERICK,
1201 Henry St., Berkeley, Calif.

Manuscript for publication should be sent to

DR. W. L. JEPSON,
2712 Benvenue Ave., Berkeley, Calif.

Dues of members are \$2.00 per year.

MRS. LINDA G. DODD, *Treasurer*,
2636 Hillegass Ave., Berkeley, Calif.

COUNCIL OF THE SOCIETY FOR 1922-1923

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The Society desires botanical books for its library. Pacific Railway Survey, vol. 4, and volumes of the Botanical Gazette will be especially appreciated.



MADROÑO

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OPEN LETTERS

Ranunculus glaberrimus Hook.

Ranunculus glaberrimus has a large broad petaled flower, but it is a small plant—budding close to the ground, the leaf and flower stems lengthening as it advances to fructification, but never getting over 3½ or 4 inches in height. So far as I have seen it never grows on moist flats. Its habitat seems to be sandy gravelly slopes, clear up to the mountain tops. It was the same in eastern Shasta County. I do not know that I ever saw it where there was not sage brush (*Artemisia tridentata*).

My note book gives the unusually early dates, "budding Feb. 4, 1921; full bloom Feb. 11." It is the warm light soil that makes it come so early. That winter we had no zero weather, but the snow lay on the ground—perhaps two weeks or more.

This buttercup has a rather long blooming period—perhaps a month or six weeks—though flowering on the individual plants does not last so long. The earliest flowers appear first in the warmest most sheltered places; later on, in such places, some plants will be losing their seeds, while a few belated ones are still blooming.

The first year I was in Modoc County I found this first flower of the season in bloom on March 4, 1903. In that year it was noticeable that there were double blossoms on many plants.—MARY H. MANNING, southern Modoc Co., July 2, 1923.

Kumlienia hystricula Greene

I am sending you by parcel post a specimen of the first spring flower which was gathered at Don Pedro on the Tuolumne River in the Sierra foothills on January 7. Is it one of our buttercups in flower so early that it has no color?—ADELINE ELLSWORTH, Stanislaus Co., Jan. 9, 1923.

This is the white-flowered *Kumlienia hystricula* Greene and a remarkably early date to find it in flower. It always grows in the coolest and moistest places in the central Sierras at altitudes of 1500 to 5000 feet. A characteristic habitat is the neighborhood of waterfalls, where it is found within reach of the flying spray or mist. I have always regarded it as a relic of the glacial period, every new fact tending to sustain this view.—W. L. J.

**THE SPECIFIC STATUS OF CLAYTONIA NEVADENSIS
WATS.**

WILLIS LINN JEPSON

A sheet of specimens (*A. L. Grant 420*) from 10,000 feet on Mt. Leavitt, which stands on the crest of the Sierra Nevada in Tuolumne County, proves on examination to answer well to *Claytonia nevadensis* Watson, which was published by Watson in the *Botany of California* (1:77) in 1876. Watson's species was based on specimens

collected by J. G. Lemmon at some station in the northern Sierra Nevada. No re-collection of this species has hitherto been reported.

In the Synoptical Flora of North America, Watson's species is referred to *Montia asarifolia* as "a reduced form," a reference that is followed by the present writer in the Flora of California. The Mt. Leavitt plant is, however, so unlike the widespread plant characteristic of *Montia asarifolia* that the writer here indicates the differences in detail.

MONTIA ASARIFOLIA Howell: 1. Plants 7 to 31.5 cm. high. 2. Scapes terete. 3. Leaves round-ovate, often broader than long. 4. Inflorescence much exceeding the leaves. 5. Flowers in a loose raceme. 6. Pedicels 12 to 30 mm. long. 7. Petals retuse. 8. Stamen filaments very slightly dilated downward.

CLAYTONIA NEVADENSIS Watson: 1. Plants 2.5 cm. high. 2. Scapes angled or narrowly wing-ridged. 3. Leaves rhomboidal-ovate, always longer than broad. 4. Inflorescence rather shorter than the leaves. 5. Flowers in an umbellate fascicle. 6. Pedicels 10 to 44 mm. long. 7. Petals obtuse or acute. 8. Stamen filaments rather markedly dilated downward.

In a somewhat superficial way *Claytonia nevadensis* Wats. does suggest a reduced form of *Montia asarifolia*, but careful study does not support such a view and it is the writer's opinion that the differentiae here indicated are satisfactory and will be confirmed by subsequent collections. The writer has not seen the type of *Claytonia nevadensis*, but the somewhat brief description in the Botany of California is reasonably satisfying. This species is, therefore, to be accepted as a valid species of *Montia*, most nearly related to *M. asarifolia* Howell, and becomes *M. nevadensis* (Wats.) Jepson n. comb.

The number of ovules in the ovary is six in the case of each species. Both species are perennial by means of slender stolon-like rootstocks, though *M. nevadensis* seems to be much more freely productive of runner-like rootstocks than *M. asarifolia*.

A Settler's Wife in Shasta County

I am sending you today by parcel post a collection of the more interesting plants of this region where we have settled. It is a good botanical field.

We have a partially cleared farm of 160 acres within the Yellow Pine belt, about one mile east of Clover Creek and perhaps forty-five miles northeast of Redding. Like others hereabouts we make a few posts and shakes between hayings (chiefly red clover, *Trifolium pratense* L. and orchard grass, *Dactylis glomerata* L.), and are growing beans, potatoes and corn. Numerous deer and occasional bear and mountain lion travel past the northern border of our place. At present there are fresh tracks of a yearling panther along our ditch bank.—ALMA AMES WEIGART, Shasta Co., Aug. 2, 1923.

A REVISION OF CALIFORNIAN UMBELLIFERAE.—IV.

WILLIS LINN JEPSON

(Continued from page 146)

- Fruit large (6 to 8½ lines long), elliptic, the wings about as broad as the body; body broadly ovate, densely tomentose; Great Valley and Sierra foothills. 8. *L. tomentosum*.
- Fruit smaller (3 to 4½ lines long), broadly elliptic to orbicular, the wings narrower than the body; body oblong-elliptic, the intervals very dark and the ribs white-hairy; interior deserts and bounding ranges. 9. *L. mohavense*.
- Bractlets scarious margined.
- Herbage glabrous save the ciliate leaf-margins. 10. *L. ciliolatum*.
- Herbage pubescent or puberulent; mostly summits and slopes towards the desert interior.
- Flowers white or pale yellow.
- Oil tubes minute, 3 or more in the intervals; fruit ovate. 11. *L. nevadense*.
- Oil tubes broad, 1 to 3 in the intervals; fruit oblong or oblong-ovate. 12. *L. plummerae*.
- Flowers purple; fruit elliptic; oil tubes broad, 1 or 2 in the intervals. 13. *L. austinae*.
- Bractlets none (rarely 1 or 2); fruit wings somewhat narrower than the body; petioles dilated into narrow sheaths their whole length; s. Sierra Nevada.
- Leaves ternate-pinnate; flowers yellow; pedicels 1 to 2 lines long; oil tubes solitary. 14. *L. torreyi*.
- Leaves quinate-pinnate; flowers whitish; pedicels 3 to 4 lines long; oil tubes indistinct. 15. *L. congdoni*.
- Leaves pinnate, linear-lanceolate in outline; desert ranges.—Subgenus CYNOMARATHRUM. 16. *L. parryi*.
- Leaves with the divisions mostly few or at least not numerous, the leaflets narrow and much elongated.—Subgenus LONCHOPHYLLUM.
- Fruit 3½ to 5½ lines long.
- Leaflets many, ⅓ to ½ line broad; n. Sierra foothills.
- Oil tubes very minute, forming a continuous chain on the dorsal side; bractlets few. 17. *L. marginatum*.
- Oil tubes solitary in the intervals; bractlets none. 18. *L. alatum*.
- Leaflets few, ½ to 1½ lines broad; oil tubes very broad, solitary in the intervals; higher n. Sierra Nevada. 19. *L. triternatum*.
- Fruit 9 lines long; Mendocino Co. 20. *L. giganteum*.

B. PEDUNCLES ENLARGED AT SUMMIT.

- Leaves with few divisions and broad leaflets; fruits very narrowly winged; bractlets none; flowers yellow; northern California.—Subgenus CRASSIPEDUNCULATUM. 21. *L. nudicaule*.

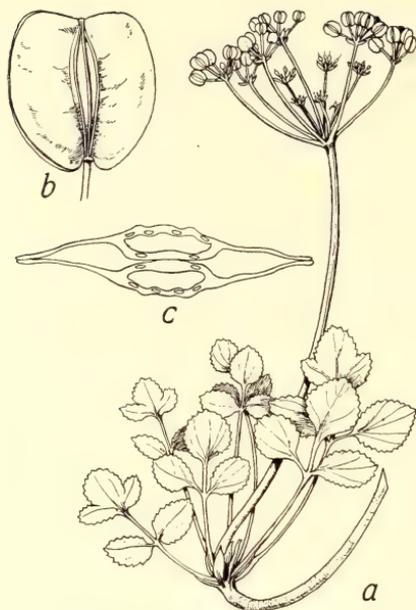
II. Stems from a globose tuber; leaflets elongated; bractlets present; oil tubes solitary in the intervals.—Subgenus COUS.

- Flowers yellow; fruit linear, the wings ¼ to ½ as wide as the body; Modoc Co. 22. *L. ambiquum*.
- Flowers white; fruit elliptic, the wings ½ as broad as body; Sierra Co. to Siskiyou Co. 23. *L. piperi*.

1. *L. lucidum* (Nutt.) Jepson n. comb. Fig. 31. Plants ½ to 1½ ft. high, glabrous, the stout peduncles from very short basal stems; leaves with 3 leaflets or the lowest ones ternate, each division with 3 leaflets; leaflets roundish to ovate, mucronate-toothed, not lobed or often 3-lobed or -parted, ¾ to 1½ in. long; rays 10 to 15, 1 to 3 in. long; pedicels 3 to 6 lines long; involuclers of lanceolate bractlets; flowers yellow; fruit nearly orbicular, emarginate at each end, glabrous, 4½ to 7½ lines long, with wings more than twice as broad as the narrowly oblong body, and prominent obtuse dorsal and intermediate ribs; oil tubes solitary in the intervals, 2 to 4 on the commissure.—Coastal Southern California.

Locs.—San Gabriel foothills, *Hasse*; Pasadena, *McClatchie*; Lytle Creek, San Antonio Mts., *Hall* 1429; San Bernardino, *Parish* 3627; Aguanga, Riverside Co., *Jepson* 1484; Palomar, *Jepson* 1535; Del Mar, *Jepson* 1615.

Var. *REPÓSTUM* Jepson n. var. Leaves ternate, each division with 3 leaflets, or the central division with 9; leaflets ½ to ¾ in. long, finely toothed; body of



31. *Lomatium lucidum* Jepson; *a*, habit x $\frac{1}{6}$; *b*, fr. x $1\frac{1}{2}$; *c*, sect. fr. x 3.

umbel 8 to 15-rayed, with involucels of linear or lanceolate acuminate bractlets; rays $\frac{3}{4}$ to $1\frac{3}{4}$ in. long; pedicels $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long; flowers yellow; fruit broadly elliptical to orbicular, $2\frac{1}{2}$ to 4 lines long, with wings broader than the body, and rather prominent dorsal and intermediate ribs; oil tubes solitary in the intervals, 2 to 4 on the commissure.—Mountains, Santa Cruz Co. to San Luis Obispo Co.

Locs.—Ridge w. of Gilroy, *Jepson*; Pajaro Hills, *Chandler* 406; Pacific Grove, *Mary S. Clemens*; San Simeon, *K. Brandegee*; Jolon, *T. Brandegee*; San Luis Obispo, *Jepson*.

Var. PÁLLIDUM *Jepson* n. comb. Herbage very pale.—Santa Lucia Mts.

Refs.—LOMATIUM PARVIFOLIUM *Jepson* n. comb. *Peucedanum parvifolium* T. & G. Fl. 1:628 (1840), type from Cal., *Douglas*. *Ferula parvifolia* H. & A. Bot. Beech. 348 (1840). *Peucedanum californicum* C. & R. Bot. Gaz. 13:143 (1888), type loc. San Luis Obispo Co., *M. E. Jones*. *Euryptera parvifolia* C. & R. Contrib. U. S. Nat. Herb. 7:241 (1900). Var. PÁLLIDUM *Jepson*. *Euryptera pallida* C. & R. l. c. 7:242 (1900), type loc. Santa Lucia Mts., *Vasey* 232. The spm. of *Vasey* 232 in the Kew Herbarium is labeled San Diego Co.

PEUCEDANUM INSULARE *Eastw.* Proc. Cal. Acad. ser. 3, 1:106, pl. 8 (1898), type loc. San Nicholas Isl., *Blanche Trask*. *Euryptera insularis* C. & R. Contrib. U. S. Nat. Herb. 7:243 (1900); peduncles dilated at summit; involuere of a single elongated bract palmately divided at apex; involucels composed of several linear bractlets; oil tubes usually 2 in the intervals, 6 on the commissure (ex char.).

3. *L. carúifolium* (T. & G.) C. & R. ALKALI PARSNIP. Fig. 32. Peduncles 3 or 4, erect, 8 to 14 in. high, arising from the crown of a stout tap-root; herbage glabrous or nearly so, or the foliage minutely pubescent; leaves ternately decomposed, dissected into linear segments barely $\frac{1}{2}$ line wide and 1 to $4\frac{1}{2}$ lines long; bractlets distinct or nearly distinct, round-ovate to oblong,

carpel elliptic, the intervals often with secondary oil tubes extending half the length.—Vaca Mts. (near Collin's Spr., *Jepson*, type).

Refs.—LOMATIUM LUCIDUM *Jepson*. *Euryptera lucida* Nutt.; T. & G. Fl. 1:629 (1840), type loc. San Diego, *Nuttall*; Torr. Bot. Mex. Bound. 70, pl. 27 (1859); C. & R. Contrib. U. S. Nat. Herb. 7:241, fig. 61 a, b (1900). *Peucedanum euryptera* Gray, Proc. Am. Acad. 7:348 (1868). *Cogswellia lucida* Jones, Contrib. 12:31 (1908). *Peucedanum hassei* C. & R. Bot. Gaz. 14:276 (1889), type loc. San Gabriel Mts., Los Angeles Co., *Hasse*. *Euryptera hassei* C. & R. Contrib. U. S. Nat. Herb. 7:242 (1900). Var. REPOSITUM *Jepson*. *Peucedanum hassei* *Jepson*, Fl. W. Mid. Cal. 302 (1911).

2. *L. parvifolium* (T. & G.) *Jepson* n. comb. Plants 7 to 12 (or 18) in. high, the peduncles arising from very short erect subterranean stems borne on the root-crown; leaves clustered near the base, bipinnate (but the upper leaflets confluent), 2 to 5 in. long; leaflets broad, irregularly incised and with broad strongly cuspidate teeth (3 or) 5 to 12 lines long;

scarious-margined, entire or denticulate, usually acuminate, often shortly petiolate; fertile rays 6 to 11, 1 to $1\frac{1}{2}$ in. long; pedicels in fruit $1\frac{1}{4}$ to 3 lines long; fruits glabrous, suborbicular or elliptic, $2\frac{1}{2}$ to $4\frac{1}{2}$ lines long, the wings $\frac{1}{2}$ to almost as wide as the body; oil tubes none on the commissure, none in the intervals or indistinct, but often with 2 or 3 obscure or superficial minor ridges.—Low wet ground: Sacramento and San Joaquin valleys, South Coast Ranges, Sierra Nevada foothills.

Locs.—Crane Creek, w. Tehama Co., *Jepson*; Red Bluff, *Jepson*; Yolo Co., *Blankinship*; Vacaville, *Jepson*; Byron, *Greene*; Berkeley, *Jepson*; San Francisco, *K. Brandegee*; Los Buellis Hills, Santa Clara Co., *R. J. Smith*; Whiterock, Mariposa Co., *Congdon*.

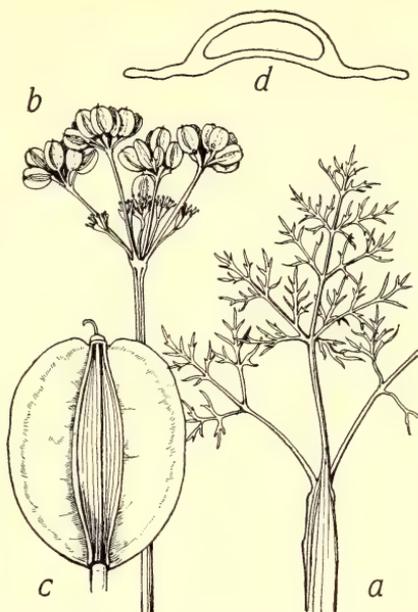
Var. *DÉNTICULÁTUM* *Jepson* nom. n. Stout, 13 to 16 in. high; leaf-segments broader; rays unequal, the fertile $2\frac{1}{2}$ to $5\frac{1}{2}$ in. long; wing-margins roughened or denticulate.—Exeter, Tulare Co., *Eastwood*. Var. *SOLANENSE* *Jepson* n. var. Rachises and leaf-segments scabridulous-puberulent.—Cannon sta., Solano Co., *Jepson*.

Refs.—*LOMATIUM CARUIFOLIUM* C. & R. Contrib. U. S. Nat. Herb. 7:216 (1900). *Peucedanum caruifolium* T. & G. Fl. 1:628 (1840); *Jepson*, Fl. W. Mid. Cal. 359 (1901). *Ferula caruifolia* H. & A. Bot. Beech. 348 (1840), type from Cal., *Douglas*. *Cogswellia caruifolia* Jones, Contrib. 12:34 (1908). Var. *PALIUS* Jones, l. c. 12:41 (1908), type loc. Tehachapi, *Jones*; oil tubes evident, 2 to 4 in the intervals (ex char.). Var. *DÉNTICULÁTUM* *Jepson* nom. n. *Peucedanum erosum* *Jepson*, Erythra, 5:1 (1897), type loc. Exeter, *Eastwood*. Var. *SOLANENSE* *Jepson*.

4. *L. vaseyi* C. & R. Peduncles ascending, 6 to 12 in. high, arising from the very short stems of the root-crown, naked or frequently with 1 or 2 leaves; foliage minutely puberulent, the plant otherwise mostly glabrous; leaves ternate-pinnate, the divisions pinnately cut into linear-oblong segments $1\frac{1}{2}$ to 3 lines long and $\frac{1}{2}$ to 1 line broad; petioles inflated, $\frac{1}{2}$ to 1 in. long; rays 5 to 14, the fertile $\frac{1}{2}$ to 2 in. long; pedicels 1 to 2 lines long; bractlets cuneate-obovate, lacinate-toothed at apex or abruptly acuminate; flowers yellow; fruit elliptic or slightly narrowed towards the base, 4 to 7 lines long, 3 to $4\frac{1}{2}$ lines wide, the body situated mostly above the middle, only about 1 line wide and half as long as the fruit but contracted at base into a stipe-like process, and at apex into a beak-like process, the whole with broad wings broader than the body; dorsal and intermediate ribs obvious with broad solitary oil tubes in the intervals, 4 on the commissure.—Dry mesas and mountain slopes, 1200 to 5500 ft.: San Diego Co.; San Bernardino Valley foothills; Inyo Co. ranges; Sierra Nevada and north to Siskiyou Co.; Napa Range.

Tax. note.—The leaves in *L. caruifolium* are quite strictly basal; in *L. vaseyi* they are less basal, tending to move up the stem, so that the peduncles appear to be 2 or 3-leaved. In this respect *L. utriculatum* is similar to *L. vaseyi*.

Locs.—El Cajon, *T. Brandegee*; Lugonia, *Parish*; San Timoteo Cañon, *Jepson* 6079; Redlands, *Parish*; San Bernardino, *Parish* 3628; Highland, *Parish*;



32. *Lomatium caruifolium* C. & R.; a, leaf $\times \frac{1}{2}$; b, fr. umbel $\times \frac{1}{2}$; c, fr. $\times 3$; d, sect. carp. $\times 5$.

Darwin Mesa (acc. Coville, Contrib. U. S. Nat. Herb. 4:116); Keene, Tehachapi Range, *Jepson* 7157; hills near Bakersfield, *Davy* 1870; Kaweah, *Eastwood*; Bower Cave, Mariposa Co., *Jepson*; Alder Creek, Yosemite Park, *Jepson* 4317; Pine Log, Tuolumne Co., *A. L. Grant* 692; Columbia, *Jepson* 6291; New York Ravine, Eldorado Co., *K. Brandegee*; Edgewood, Siskiyou Co., *Curran*; Napa Range near Calistoga, *Jepson*.

Refs.—LOMATIUM VASEYI C. & R. Contrib. U. S. Nat. Herb. 7:216 (1900). *Peucedanum vaseyi* C. & R. Bot. Gaz. 13:144 (1888), type loc. San Bernardino Mts., *Vasey* 231; *Jepson*, Fl. W. Mid. Cal. 359 (1901). *Cogswellia vaseyi* C. & R. Contrib. U. S. Nat. Herb. 12:451 (1909). *Cogswellia caruifolia* var. *vaseyi* Jones, Contrib. 12:41 (1908). *Cogswellia chandleri* Jones, Contrib. 13:11 (1910), type loc. Nelson Range, Inyo Co., *Hall & Chandler* 7157; while the type specimens are only in flower and very young fruit, comparison seems to show rather conclusively that this binomial must be a synonym of *L. vaseyi*. *Lomatium chandleri* McB. Contrib. Gray Herb. 53:15 (1918).

5. *L. utriculatum* (T. & G.) C. & R. Plants 8 to 12 in. high, the peduncles from short stems or from the root crown, usually glabrous except the minutely puberulent leaves; leaves ternate, then pinnately decomposed and dissected into linear segments 1 to 3 lines long; petioles conspicuously inflated, membranaceous, 3 to 7 lines broad; umbellets in flower hemispherical or only a little more than a hemisphere; rays 3 to 15, very unequal, the fruiting ones $\frac{1}{2}$ to 2 (or 3) in. long; fruiting pedicels 2 to 6 lines long; involucre none or occasionally with 1 often foliaceous bract; bractlets round-obovate to oblanceolate, entire or toothed, usually acuminate, short-petiolate, equaling the yellow flowers; fruits narrowly elliptic, $2\frac{1}{4}$ to 4 (or $5\frac{1}{2}$) lines long; wings as broad as or narrower than body; oil tubes 4 to 6 on the commissure, 1 in each interval or with short accessory ones in the dorsal intervals.—Open grassy hills or plains, the most common species, frequent from Southern California northward through the Coast Ranges and Sierra Nevada foothills to Oregon.

Locs.—Coast Ranges: Willow Creek, Trinity River, *Tracy* 3374; Vaca Mts., *Jepson*; Berkeley, *Jepson*; Coyote, Santa Clara Valley, *Jepson*. Sierra Nevada: Oroville, *Heller* 11259; Folsom, *K. Curran*; New York Ravine, Eldorado Co., *K. Brandegee*. Southern California: San Bernardino, *S. B. & W. F. Parish*. Desert region: Argus Mts., *Purpus* 5439. Var. GLABRUM *Jepson* n. var. Herbage glabrous.—Alcalde, w. Fresno Co., *Eastwood* (type); Caliente, Kern Co., *T. Brandegee*; Tehachapi, *T. Brandegee*; Manzanita, *Davy* 2357.

Refs.—LOMATIUM UTRICULATUM C. & R. Contrib. U. S. Nat. Herb. 7:215 (1890). *Peucedanum utriculatum* Nutt.; T. & G. Fl. 1:628 (1840), type loc. plains near junction of the Willamette and Columbia rivers, Ore., *Nuttall*; *Jepson*, Fl. W. Mid. Cal. 359 (1901). *Cogswellia utriculata* Jones, Contrib. 12:34 (1908). Var. GLABRUM *Jepson*.

6. *L. macrocarpum* (Nutt.) C. & R. Plants 10 to 17 in. high, the peduncles several from a short scaly caudex; herbage thinly short-pubescent; leaves in a basal or sub-basal tuft, 2 to 5 in. long, or the earliest often as much as 1 ft. long, once or twice ternate, and twice pinnately divided, the segments linear, acute, $\frac{1}{2}$ to $2\frac{1}{2}$ lines long, the ultimate divisions of the rachis winged; fruiting rays about equal, $\frac{1}{2}$ to 4 in. long; pedicels $2\frac{1}{2}$ to $4\frac{1}{2}$ lines long; involucre of many lanceolate bractlets mostly exceeding the umbellets, sometimes united at base and unilateral; flowers dull white or pale yellow; corolla glabrous; ovary glabrous or nearly so; fruit oblong to ovate, mostly narrow, but sometimes very broad and somewhat quadrangular, $5\frac{1}{2}$ to 8 (or 10) lines long, 2 to $3\frac{1}{2}$ lines wide, the ribs inconspicuous or almost obsolete; oil tubes 1 to each interval, 2 to 6 on the commissure, the seed sharply channeled beneath those of the dorsal intervals; wings broader, sometimes narrower than the body.—Open stony hills, Coast Ranges and Sierra Nevada northward to British Columbia.

A common and widely distributed species. The farinaceous roots were used as food by the northern Indians. The northern forms (as Lyall's Fort, Wash-

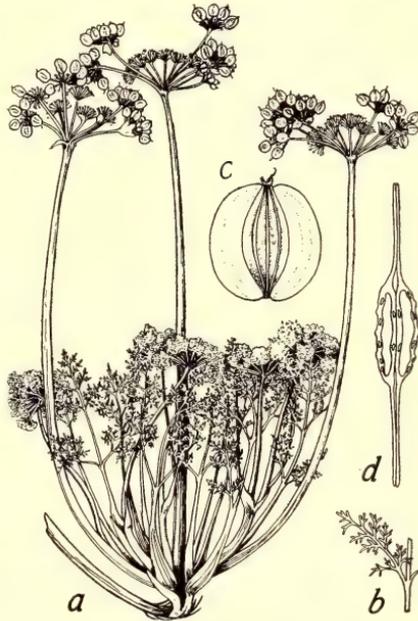
ington, *Colville* in Herb. Kew) often have tuberous tap-roots, and also cord-like secondary roots developing 1 or 2 more deeply seated tubers. Such tubers should be searched for in our California plants. That they do not appear in some specimens is doubtless due to not digging deeply. Probably they will be found in *L. nevadensis*; in the var. *holopterum* they show well in spms. from Good Sprgs., s. Nev., *K. Brandegee*.

Locs.—Sierra Nevada: Honey Lake, *T. Brandegee*; Cold Spr., Tuolumne Co., *Jepson* 6460; Alder Creek, Yosemite Park, *Jepson* 4318; Mariposa, *Congdon*; Greenhorn Range, Kern Co., *Hall & Babcock* 5076 (fruit $3\frac{1}{2}$ lines long). Coast Ranges: East Fork Illinois River, Siskiyou Mts. (Ore.) *Jepson* 2936; Edgewood, *T. Brandegee*; Devil's Backbone, sw. Siskiyou Co., *Jepson* 2103; Crane Creek, w. Tehama Co., *Jepson* (ovaries pubescent); Asa-Bean Ridge, ne. Mendocino Co., *Jepson*; head of Weldon Cañon, Vaca Mts., *Jepson* 7197; Vanden, Solano Co., *Jepson*; Howell Mt. foothills, *Jepson*; Sonoma Valley, *Jepson* 4184; Antioch, *K. Curran*; Redwood City, *Jepson* 5736 (fl.), *Elena A. Goodwin* (fr.); Coyote Creek, Santa Clara Co., *Jepson*; Pico Blanco, *Davy* 7532; Jolon, Monterey Co., *Eastwood* (leaves very finely dissected); San Emigdio Cañon, *Davy* 2071 (fl. purplish).

Var. *DOUGLASHII* *Jepson* n. var. Leaf-segments larger, as much as $4\frac{1}{2}$ lines long and 1 line wide; umbel sometimes with a single bract.—California, *Douglas* (type). Var. *ELLIPTICUM* *Jepson* n. comb. Caudex bearing short leafy branches; leaf-segments oblong, cuspidate; fruit broadly elliptical, notched at base and apex, $9\frac{1}{2}$ lines long and $4\frac{1}{2}$ lines broad, the wings twice as wide as the body; dorsal and intermediate ribs obscure or filiform.—Feather River near Marysville, *Bigelow*; region of the "head waters of the Sacramento" (Pitt River branch), *Snyder*.

Refs.—*LOMATIUM MACROCARPUM* C. & R. Contrib. U. S. Nat. Herb. 7:217 (1900). *Peucedanum macrocarpum* Nutt.; T. & G. Fl. 1:627 (1840), type loc. Columbia River, Ore., *Nuttall*. *Cogswellia macrocarpa* *Jones*, Contrib. 12:33 (1908). Var. *DOUGLASHII* *Jepson*. Var. *ELLIPTICUM* *Jepson*. *Peucedanum nudicaule* var. *ellipticum* T. & G. Pac. R. Rep. 2²:121 (1855), type loc. Round Valley near the sources of the Sacramento River, *Snyder*. *Lomatium ellipticum* C. & R. l. c. 7:217 (1900).

7. *L. dasycarpum* (T. & G.) C. & R. Fig. 33. Plants 1 to $1\frac{1}{2}$ ft. high, the peduncles arising from the root crown or from very short stems; herbage puberulent; peduncles and wings of carpels often purplish; leaves ternately decompose and dissected into oblong or linear segments, these 1 to 2 or 3 lines long; umbels somewhat equally 6 to 15-rayed; rays 1 to 2 in. long; bractlets linear to ovate, more or less tomentose; pedicels in fruit about $\frac{1}{2}$ in. long, usually longer than the carpels; flowers white; fruit purplish or whitish, broadly elliptic to orbicular, with subcordate base, $3\frac{1}{2}$ to 4 (or 7) lines long, the wings thin membranaceous, 2 to 3 times the width of the very narrow or somewhat spindle-shaped body; oil tubes usually 1 in the intervals (often a second one in the lateral intervals),



33. *Lomatium dasycarpum* C. & R.; a, habit x $\frac{1}{4}$; b, pinna of leaf x $\frac{1}{2}$; c, fr. x $1\frac{1}{2}$; d, sect. fr. x 4.

2 to 4 on the commissure.—South Coast Ranges from Contra Costa Co. to San Diego Co.

Locs.—The type of *L. dasycarpum* is here assumed to be the plant of the South Coast Ranges, with the ultimate leaf segments oblong to broadly linear and $\frac{1}{2}$ to 1 line long, and the oil tubes commonly 1 in the intervals. The reddish wings of the fruit develop early, are only slightly pubescent and thus differ markedly from the tomentulose or pubescent body. The number of oil tubes is not, however, constant, usually not even in a single individual, and hence is not a critical differential factor. We cite specimens as follows: Stone-wall Mine, Cuyamaca Mts., *Parish* 4419; San Diego, *Hall* 3936; Thomas Valley, San Jacinto Mts., *Jepson* 1471; Los Angeles, *Davidson* (1 oil tube in the dorsal intervals, 2 or 3 in the lateral, 4 on the commissure); Saugus, *K. Brandegee* (1 oil tube in the intervals, 4 on the commissure); Santa Inez Mts., *Hall* 7850 (1 oil tube in the dorsal intervals, 2 in the lateral, 4 on the commissure), *T. Brandegee* (1 oil tube in the intervals, 2 on the commissure); Merrill Valley, s. San Benito Co., *Hall* 9923 (1 or 2 oil tubes in the dorsal intervals, 2 in the lateral, 2 or 4 on the commissure); mts. w. of Gilroy, *Jepson* (2 oil tubes in the intervals, 2 on the commissure); Redwood City, *Jepson* 5737 (fl.), *Elena R. Goodwin* (oil tubes 1 in the dorsal intervals, 2 in the lateral, 2 on the commissure); Mt. Diablo, *Jepson* 7579 (1 oil tube in the dorsal intervals, 2 in the lateral, 2 on the commissure); South San Francisco, *Eastwood* (1 or 2 oil tubes in the dorsal intervals, 2 or 3 in the lateral, 2 or 4 on the commissure); San Francisco, *Jepson*. It will thus be seen as we proceed northward in the South Coast Ranges that the oil tubes are more frequently 2 or 3 in the intervals, 1 oil tube being less commonly found. The plants of the North Coast Ranges have most commonly 2 or 3 oil tubes in the intervals; in addition the bractlets are usually more strongly developed (mostly broadly ovate) and the body of the carpel is broader, nearly equaling the wings in breadth. These northern plants we cite under var. *MEDIUM* *Jepson* n. var. as follows: Ross Valley, Marin Co., *Jepson* (2 oil tubes in the intervals, 4 on the commissure); Mt. Tamalpais, *Jepson* 1192c; Napa, *Jepson* (2 or 3 oil tubes in the dorsal intervals, 2 in the lateral, 4 on the commissure); Conn Valley, *Jepson*, type (2 or 3 oil tubes in the dorsal intervals, 1 in the lateral, 2 on the commissure); Howell Mt., *Jepson* 517; Yaca Mts., *Jepson* (oil tubes 2 or 3 in the dorsal intervals, 2, 3, or 4 in the lateral, 4 on the commissure); Mayacamas Range (e. of Ukiah), *Jepson* 3012; Indian Valley, ne. Lake Co., *Jepson* 8990 (oil tubes 2 or 3 in the intervals); Seward Ridge, s. Humboldt Co., *Jepson* 1891; ridge betw. Van Duzen and Mad Rivers, *Tracy* 2890 (3 oil tubes in the intervals, 4 on the commissure); Klamath River, n. Humboldt Co., *Chandler* 1445 (oil tubes 2 or 3 in the dorsal intervals, 2 in the lateral, 4 on the commissure). In habit, foliage, pedicels, in size of fruit and thinness of wings the var. *medium* is more closely associated with *L. dasycarpum* than with *L. tomentosum*, although in character of the oil tubes it may be regarded as intermediate between these two species. As here accepted *L. tomentosum* is restricted geographically to the area of the Great Valley and Sierra Nevada foothills. It has linear or filiform leaf segments ($1\frac{1}{2}$ to 2 lines long) and larger fruits (6 to 7 lines long); the ovary is densely woolly, but by the time it is half grown the wings are often still inconspicuous, so tardily do they develop.

In the San Carlos Range occurs the var. *DECORUM* *Jepson* n. var. Procumbent peduncles with white flowers; erect peduncles with lilac-purple flowers.—North Fork Lewis Creek, *Jepson* 2704. Apparently the procumbent white-flowered peduncles later become erect and the flowers change in color to lilac-purple.

Refs.—*LOMATIUM DASYCARPUM* C. & R. Contrib. U. S. Nat. Herb. 7:218 (1900). *Peucedanum dasycarpum* T. & G. Fl. 1:628 (1840), type from Cal., *Douglas*. *Cogswellia dasycarpa* Jones, Contrib. 12:34 (1908). *Peucedanum pringlei* C. & R. Bot. Gaz. 13:209 (1888), type loc. San Diego, *Pringle*. Var. *MEDIUM* *Jepson*. Var. *DECORUM* *Jepson*.

PEUCEDANUM JAREDI Eastw. Zee, 5:88 (1900), type loc. Estrella, San Luis Obispo Co., *Jared*; petals green, fading yellowish; oil tubes 2 or 3 in the intervals, 3 or 4 on the commissure (ex char.); this seems related to *L. dasycarpum* C. & R.

8. *L. tomentosum* (Benth.) C. & R. Plants 12 to 20 in. high, the peduncles arising from very short stems; herbage tomentulose; leaves ternately compound into filiform segments; umbels 10 to 20-rayed, the rays $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long; pedicels mostly shorter than the carpels; flowers white; bractlets ovate, acuminate; ovaries heavily clothed in white wool; fruit large, elliptic, 6 to $8\frac{1}{2}$ lines long, usually densely tomentose, the wings little if at all wider than the broadly ovate body; oil tubes usually 2 or 3 in the intervals, 2 or 4 on the commissure.—Great Valley and Sierra Nevada foothills.

Locs.—Tehachapi, *K. Brandegee* (2 oil tubes in the intervals); Green Gulch, Mariposa Co., *Congdon* (2 or 3 oil tubes in the intervals, 2 on the commissure); Elmira, *K. Curran* (2 or 3 oil tubes in the intervals, 2 on the commissure); Oroville, *Heller* 11259; Dibble Creek, w. Tehama Co., *Jepson*.

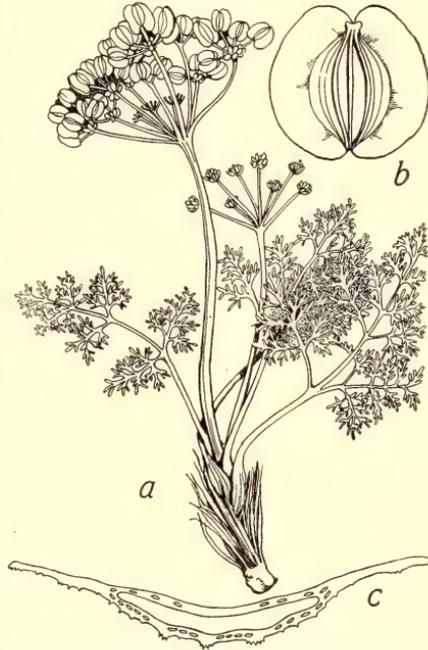
Refs.—*LOMATIUM TOMENTOSUM* C. & R. Contrib. U. S. Nat. Herb. 7:219 (1900). *Peucedanum tomentosum* Benth. Pl. Hartw. 312 (1849), type loc. Sacramento Valley, *Hartweg* 257. *Cogswellia tomentosa* Jones, Contrib. 12:35 (1908).

9. *L. mohavense* C. & R. Fig. 34. Low plants (7 to 10 in. high), the stout peduncles ascending from the root crown, not much exceeding the pinnately decomposed leaves, the segments crowded, obovate or oblong, the whole plant hoary with short pubescence; umbel somewhat unequally 6 to 12 (or more)-rayed; involuclers inconspicuous, consisting of small linear-lanceolate acuminate bractlets; umbellets very numerous; fruit broadly elliptic to almost orbicular, 3 to $4\frac{1}{2}$ lines long, the wings not as broad as the body; oil tubes usually 3 or 4 (sometimes 2 or 5) in the intervals with 4 to 8 on the commissure.—Colorado and Mohave deserts and their bordering ranges, north to Inyo Co., 4000 to 11,000 ft.

Locs.—Blair Valley, e. San Diego Co., *Jepson* 8673; Nigger Jim Hill, San Jacinto Mts., *Hall* 1184; Antelope Valley, *Davidson*; Manzana, *Davy* 2623; Thomas Valley to Vandeventer, *Jepson* 1332; Stoddard Well, *Jepson* 5923; Ord Mt., *Jepson* 5868; Kramer, *Jepson* 5346; Mt. Pinos, *Hall* 6516; Walker Pass, *Purpus* 5352; Campito Mt., White Mts., *Jepson* 7281.

Refs.—*LOMATIUM MOHAVENSE* C. & R. Contrib. U. S. Nat. Herb. 7:234 (1900). *Peucedanum mohavense* C. & R. Rev. N. A. Umbell. 62 (1888), type loc. Yucca, Mohave Desert, *Curran*. *Cogswellia mohavensis* Jones, Contrib. 12:34 (1908). *Peucedanum argense* Jones, l. c. 8:30 (1898); type loc. Lone Pine, Inyo Co., *Jones*. *Lomatium argense* C. & R. Contrib. U. S. Nat. Herb. 7:234 (1900).

10. *L. ciliolatum* Jepson n. sp. Peduncles and leaves from the crown of the tap-root; peduncles spreading, $1\frac{1}{2}$ to 4 in. long; whole plant glabrous except the margins of the leaves which are finely and regularly ciliate; leaves



34. *Lomatium mohavense* C. & R.; a, habit x $\frac{1}{4}$; b, fr. x 2; c, sect. carp. x 5.

ovate in outline, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, simply pinnate, the leaflets $\frac{1}{4}$ to $\frac{3}{4}$ in. long, irregularly pinnatifid into ovate segments; rays 3 to 5 unequal, $\frac{1}{4}$ to $1\frac{1}{4}$ in. long; pedicels $\frac{1}{2}$ to 1 line long; involucre none; involucels of several ovate bractlets with dark purple veins; fruit elliptic, $3\frac{1}{2}$ to 4 lines long; lateral ribs with narrow wings (about $\frac{1}{4}$ line wide); dorsal and lateral ribs filiform, inconspicuous, the dorsal and lateral intervals with 3 or 4 striae; oil tubes obscure, 4 or 5 in the intervals, 2 on the commissure.—Yollo Bolly Mts.

Loc.—Soldiers Ridge near South Yollo Bolly, *Jepson* (type).

11. *L. nevadense* (Wats.) C. & R. Plants 4 to 7 in. high, the peduncles ascending from very short erect stems rising from the root crown; herbage, rays and pedicels minutely pubescent; leaves decomposed, the ultimate division pinnately divided into acute segments 1 to 2 lines long; umbel unequally 5 to 11-rayed, the rays $\frac{1}{2}$ to 4 in. long; bractlets ovate to linear-lanceolate, scarious-margined, distinct or united at base; pedicels $1\frac{3}{4}$ to 4 lines long; flowers white with pubescent ovaries; fruit ovate, acute, minutely pubescent, 3 to 5 lines long, the wings narrower or almost as broad as the body; ribs on the back very fine or somewhat obscure, sometimes with supplementary striae in the intervals; oil tubes 3 or 4 in the intervals, 4 to 6 on the commissure.—East side of the Sierra Nevada from Mono Co. to Modoc Co. Southeastern Oregon to Nevada.

Locs.—Sonora Pass, *A. L. Grant* 356; Prosser Creek, Nevada Co., *Sonne*; Martis Creek, Truckee, *Sonne*; Goose Lake Valley, *R. M. Austin*.

Var. *PARISHII* Jones. Ultimate leaf segments 2 to 4 lines long, or often elongated linear and up to 12 lines long; involucel unilateral, deeply toothed; pedicels $\frac{1}{2}$ to 3 lines long; ovaries and fruit glabrous; fruit round-ovate to narrowly or broadly elliptic, $3\frac{1}{2}$ to 5 lines long; wings usually narrower than the body; ribs filiform, often with 3 or 4 supplementary striae of the same size in the intervals; oil tubes exceedingly small, several in the intervals.—Ranges in and bordering the Mohave Desert.

Locs.—Templeton Mt., Tulare Co., *Jepson* 4973 (on about 100 acres of the flats near the mountain it is the dominant species); Lone Pine, *Hall & Chandler* 7205; Fish Creek, se. Tulare Co., *Hall & Babcock* 5204; Pah Ute Peak, Kern Co., *Purpus* 5288; Nelson Range, Inyo Co., *Hall & Chandler* 7155; Hanaupah Cañon, Panamint Range, *Jepson* 7048; Ord Mt., *Jepson* 5881; Bear Valley, *Parish* 1828; Lytle Creek, San Antonio Mts., *Hall* 1442.

Var. *HOLÓPTERUM* *Jepson* n. var. Similar to the var. *parishii*; more finely puberulent; lateral wings of fruit broader (1 to $1\frac{1}{4}$ lines broad, commonly almost as broad as the body, straw-color; intermediate and dorsal ribs filiform but more evident; oil tubes showing markedly from the outside.—Eastern Mohave Desert; east into southern Nevada.

Locs.—Bonanza King Mine, Providence Mts., *Munz, Johnston & Harwood* 4236 (type); Barnwell, New York Mts., *K. Brandegee*. Good Sprs., s. Nev. *K. Brandegee*.

Refs.—*LOMATIUM NEVADENSE* C. & R. Contrib. U. S. Nat. Herb. 7:220 (1900). *Peucedanum nevadense* Wats. Proc. Am. Acad. 11:143 (1876), type loc. Unionville, Nev., *Watson* 469. *Cogswellia nevadensis* Jones, Contrib. 12:33 (1908). Var. *PARISHII* Jones, l. c. *Peucedanum parishii* C. & R. Bot. Gaz. 13:209 (1888), type loc. Bear Valley, San Bernardino Mts., *Parish* 1828. *Lomatium parishii* C. & R. Contrib. U. S. Nat. Herb. 7:235 (1900). Var. *HOLÓPTERUM* *Jepson*.

12. *L. plummerae* C. & R. Plants 8 to 12 in. high, the peduncles stoutish, widely spreading, arising from very short stems; herbage glabrous and somewhat glaucous; leaves ternately decomposed, the numerous crowded ultimate segments very small, oblong, more or less confluent; umbel very unequally 6 to 12-rayed, with involucels of numerous lanceolate acuminate bractlets; rays $\frac{1}{4}$ to $1\frac{1}{2}$ in. long; pedicels 1 to 4 lines long; flowers white; fruit oblong or oblong-ovate, usually acute at apex, glabrous, $3\frac{1}{2}$ to 4 lines long, $1\frac{3}{4}$ to $2\frac{1}{4}$ lines broad, with wings half to as broad as the body, and indistinct dorsal and intermediate ribs; oil tubes 1, 2 or 3 in the intervals, 4 to 6 on the commissure.—Northern Sierra Nevada from Sierra Co. to Shasta Co.

Locs.—Sierra Valley, *Lemmon* 32; Marston sta., Plumas Co., *Heller* 10838; Shasta Co. (acc. *Coulter & Rose*).

Var. *SÓNNEI* Jepson n. comb. Flowers yellow; oil tubes 1 or 2 in the intervals.—Eastern Nevada Co.; thence east to Washoe Co., Nev.

Refs.—*LOMATIUM PLUMMERAE* C. & R. Contrib. U. S. Nat. Herb. 7:232 (1900). *Peucedanum plummerae* C. & R. Bot. Gaz. 14:278 (1889), type loc. Sierra Valley, *Lemmon* 32. *Cogswellia plummerae* Jones, Contrib. 12:34 (1908).

Var. *SONNEI* Jepson. *Lomatium sonnei* C. & R. Contrib. U. S. Nat. Herb. 7:236 (1900), type loc. Verdi, w. Nev., *Sonne*.

13. *L. áustinae* C. & R. Plants 9 in. high, the peduncles arising from short stems; herbage puberulent; ultimate leaf segments pinnately divided into narrow divisions; flowers purplish; fruit glabrous, 3 lines long, $1\frac{1}{4}$ lines broad; oil tubes very broad, solitary in the dorsal intervals, mostly 2 in the lateral, 4 on the commissure.—Sierra Nevada from Plumas Co. to Siskiyou Co., 3000 to 5000 ft. This species is inadequately distinguished from *L. plummerae*.

Locs.—Mohawk Valley, *Lemmon*; Yreka (acc. *Coulter & Rose*).

Refs.—*LOMATIUM AUSTINAE* C. & R. Contrib. U. S. Nat. Herb. 7:236 (1900). *Peucedanum austinae* C. & R. Bot. Gaz. 13:208 (1888), type loc. Big Mdws., Plumas Co., *R. M. Austin*. *Cogswellia austinae* Jones, Contrib. 12:35 (1908).

14. *L. tórreyi* C. & R. Plants 3 to 10 in. high, the peduncles slender, arising from the root crown and densely clothed at base with old leaf-sheaths; herbage glabrous; leaves small, ternate-pinnate or bipinnate, the ultimate segments linear, cuspidate, 1 to 3 lines long; umbel unequally few-rayed, the rays $\frac{1}{2}$ to $1\frac{1}{2}$ in. long; involucre none; bractlets none, or 1 or 2 and small; pedicels 1 to 2 lines long; flowers yellow; calyx teeth small or obsolete; fruit narrowly oblong to linear, truncatish at base, 4 to 5 lines long, with wings not half as broad as the body; oil tubes solitary in the intervals.—Clefts of granite rocks, Sierra Nevada from Mariposa Co. to Tulare Co., 6000 to 7200 ft.

Locs.—Lake Merced, Yosemite Park, *Jepson* 3207; Eagle Peak trail to El Capitan, Yosemite, *Jepson* 4368; Alta Mdws., Tulare Co., *K. Brandegee*; Mt. Moses, *Purpus* 1531.

Refs.—*LOMATIUM TORREYI* C. & R. Contrib. U. S. Nat. Herb. 7:229 (1900). *Peucedanum torreyi* C. & R. Bot. Gaz. 14:276 (1889), type loc. Yosemite, *K. Curran*. *Cogswellia torreyi* Jones, Contrib. 12:35 (1908).

15. *L. cóngdoni* C. & R. Plant 6 to 9 in. high, the peduncles ascending from the basal tuft of leaves; herbage glabrous; leaves first palmately quaternate or quinate (1 or 2 of the divisions small), then bi- or tri-pinnate, the rachises more or less scaberulous; ultimate segments linear, acute; sheaths whitish, narrow, extending the full length of the petiole; fertile rays 6 to 8, $\frac{3}{4}$ to 2 in. long; involucels none; flowers apparently white; pedicels spreading, 3 to 4 lines long; fruit nearly elliptical, slightly broader above, 4 to $4\frac{1}{2}$ lines long, the wings slightly narrower than the body; dorsal and intermediate ribs filiform; oil tubes very obscure, 1 or 2 (or perhaps more) in the intervals.—Mariposa Co.

Locs.—West Water Ditch, *Congdon*; Mariposa, *Congdon*.

Refs.—*LOMATIUM CONGDONI* C. & R. Contrib. U. S. Nat. Herb. 7:232 (1900), type loc. West Water Ditch, Mariposa Co., *Congdon* 114. *Cogswellia congdoni* Jones, Contrib. 12:34 (1908).

16. *L. párryi* (Wats.) Jepson n. comb. Plants 6 to 10 in. high, the peduncles erect, arising from a caudex densely clothed with the fibrous sheaths of old leaves; herbage glabrous, foliage eventually grayish; leaves pinnate, linear-lanceolate in outline, 6 to 8 in. long, the pinnae distant, pinnately divided into linear cuspidate segments, $1\frac{1}{2}$ to 3 lines long; fruiting rays 1 to $1\frac{1}{2}$ in. long, nearly equal; pedicels slender, 3 to 6 lines long; bractlets several, linear, acute, entire or cleft at apex, nearly equaling the pedicels in length; stylopodium more or less evident in fruit; fruit oblong, 6 lines long; dorsal and intermediate wings sharp, the lateral wings about as broad as the body; oil tubes 1 or 2 in

the dorsal intervals, 2 or 3 in the laterals, 4 to 7 on the commissure.—Rocky mountain slopes, 5000 to 8000 ft., eastern Mohave Desert and Death Valley region. East to Utah.

Locs.—Providence Mts., *T. Brandegee*; Telescope Peak, Panamint Range, *Jepson* 7016. Charleston Mts., Nev., *Purpus* 6086.

Refs.—LOMATIUM PARRYI *Jepson*. *Peucedanum parryi* Wats. Proc. Am. Acad. 11:143 (1876), type loc. Valley of the Virgin, Washington Co., Utah, *Parry* 85. *Cogswellia parryi* Jones, Contrib. 12:32 (1908). *Cynomarathrum parryi* C. & R. Contrib. U. S. Nat. Herb. 7:246 (1900). *Peucedanum scopulorum* Jones, l. c. 8:31 (1898), type loc. Pleasant Cañon, Panamint Range, *Jones*.

17. **L. marginatum** C. & R. Plants 12 to 20 in. high, the peduncles slender, erect, borne on very short stems (1 in. long) rising from the root crown; herbage glabrous or the rays sometimes puberulent; leaves large, 2 to 3 times ternate, then pinnately divided into narrowly linear to filiform segments; flowers whitish or yellowish; fruiting rays few, slender, 1½ to 3½ in. long; pedicels slender, 2 to 3 lines long; bractlets few, narrowly linear, elongated, acuminate, or sometimes none; fruit (immature) elliptic-oblong, glabrous, 3½ to 4 lines long, the wings as broad as the body; dorsal ribs fine or obscure.—Rocky slopes, northern Sierra Nevada foothills from Calaveras Co. to Butte Co., 1000 to 1500 ft.

Locs.—New York Ravine, Eldorado Co., *K. Brandegee*; Salmon Falls, Eldorado Co., *K. Brandegee*; American River, *Brewer* 4536 (acc. *Coulter & Rose*); Gwin Mine, Calaveras Co., *Jepson* 1816.

Tax. note.—We have compared at Kew the type number of this species (*Hartweg* 260) with types or typical material of related species and it is our judgment that *L. marginatum* is most nearly allied to *L. ambiguum* var. *leptocarpum* *Jepson*.

Refs.—LOMATIUM MARGINATUM C. & R. Contrib. U. S. Nat. Herb. 7:223 (1900). *Peucedanum marginatum* Benth. Pl. Hartw. 312 (1849), type loc. east side of the Sacramento Valley (probably Butte Co.), *Hartweg* 260. *Cogswellia marginata* Jones, Contrib. 12:35 (1908).

18. **L. alatum** C. & R. Similar to *L. marginatum*; involucels none; oil tubes solitary in the intervals.—Sierra foothills in Sacramento Co.

Var. PURPUREUM *Jepson* n. var. Flowers purple.—Conn Valley, Napa Range, *Jepson* (type).

Refs.—LOMATIUM ALATUM C. & R. Contrib. U. S. Nat. Herb. 7:228 (1900). *Peucedanum triternatum* var. *alatum* C. & R. Rev. N. Am. Umbell. 70 (1888), type loc. Folsom, *Curran*. Var. PURPUREUM *Jepson*.

19. **L. triternatum** (Pursh) C. & R. Plants 1½ to 2 ft. high; herbage minutely puberulent; peduncles arising from the root crown or borne on stems 3 or 4 in. long, the parts at base sheathed by scale-like petioles; leaves twice or thrice ternate, then pinnate, the leaflets narrowly linear, acute, 1 to 4 in. long; flowers bright yellow; fruiting rays very unequal, 1 to 3½ in. long; bractlets setaceous; fruiting pedicels ½ to 2½ lines long; fruit oblong, glabrous, 5 to 5½ lines long; dorsal and intermediate ribs prominent, the wings half the breadth of the body; oil tubes large, broad, 1 in each interval, 2 on the commissure.—Northern Sierra Nevada from Nevada Co. to Modoc Co., thence westerly to northern Humboldt Co. Far north to British Columbia.

Econ. note.—The roots were gathered and dried for food by the Indians; they contain much starch and have a mild sweet taste (Pac. R. Rep. 2:121).

Locs.—Hupa, *Chandler* 1378; Klamath hills, Siskiyou Co., *Butler* 1380; Hornbrook, *K. Brandegee*; Willow Creek, Modoc Co., *R. M. Austin*; Dixie Valley, Lassen Co., *Baker & Nutting*.

Refs.—LOMATIUM TRITERNATUM C. & R. Contrib. U. S. Nat. Herb. 7:227 (1900). *Seseli triternatum* Pursh, Fl. 1:197 (1814), type loc. main Kooskooskee, Columbia River, *Lewis*. *Peucedanum triternatum* Nutt.; T. & G. Fl. 1:626 (1840). *Cogswellia triternata* Jones, Contrib. 12:32 (1908).

20. *L. gigantéum* C. & R. Plants $1\frac{1}{4}$ to $2\frac{1}{4}$ ft. high, finely pubescent throughout; leaves very large, ternately compound; leaflets linear-oblong, elongated, $3\frac{1}{2}$ to $4\frac{3}{4}$ in. in length, usually entire, very pale; rays about 11, very unequal, the longer ones 4 in. long; pedicels 1 to 2 lines long; involucrel of linear bractlets; flowers yellow; ovary pubescent; fruit linear-oblong, 7 to 9 lines long, with wings much narrower than body, glabrous or nearly so.—Mendocino Co.

Loc.—Mendocino Co., *Bolander* 5521.

Refs.—*LOMATIUM GIGANTEUM* C. & R. Contrib. U. S. Nat. Herb. 7:240 (1900), type from Cal., probably Mendocino Co., *Vasey*. *Cogswellia gigantea* Jones, Contrib. 12:32 (1908).

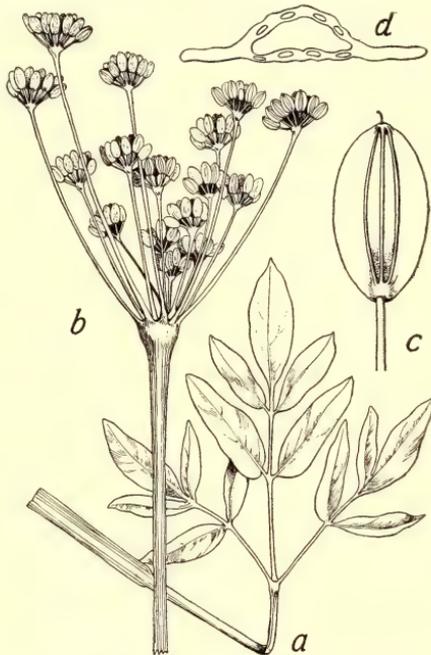
21. *L. nudicaule* (Pursh) C. & R. PESTLE PARSNIP. Fig. 35. Plants 8 to 20 in. high, glabrous; leaves $3\frac{1}{4}$ to $5\frac{3}{4}$ in. long, once or twice ternate, then pinnate with 5 to 9 leaflets; leaflets broadly ovate to lanceolate, entire or few-toothed at apex, $\frac{3}{4}$ to $2\frac{1}{4}$ in. long; peduncles stoutish, arising from the base, conspicuously enlarged at summit (pestle-like) and bearing 6 to 18 very unequal rays, the outer sometimes 2 to 4 times the length of the inner; rays in fruit dilated at apex, 1 to $6\frac{1}{2}$ in. long; fruiting pedicels 1 to 3 lines long; bracts and bractlets none; flowers yellow; fruit oblong to elliptic, 5 to 7 lines long, 2 to 3 lines wide, the wings $\frac{1}{2}$ the breadth of the body; oil tubes broad, solitary in the dorsal intervals, 1 or 2 in the laterals, 4 to 6 on the commissure.—Low open foothills or rolling plains: Coast Ranges from Santa Clara Co. to Siskiyou Co.; Sierra Nevada from Amador Co. to Modoc Co. North to Washington.

Locs.—Coast Ranges: Mt. Hamilton, *Jepson* 4210; Mt. Diablo, *Jepson*; Sonoma Valley, *Jepson* 4771; Napa, *Jepson*; Conn Valley, *Jepson*; Cannon sta., Solano Co., *Jepson*; Yreka, *Butler* 1363. Sierra Nevada: Genesee Valley, *Hall & Babcock* 4441; Sierra Valley, *Jepson* 8045; Jess Valley, Modoc Co., *L. S. Smith*; Goose Lake Valley, *Austin & Bruce* 2287.

Var. *PUBERULUM* *Jepson* n. comb. Minutely pubescent.—Mendocino Co., *Bolander* 6521.

Refs.—*LOMATIUM NUDICAULE* C. & R. Contrib. U. S. Nat. Herb. 7:238 (1900). *Smyrniun nudicaule* Pursh, Fl. 1:196 (1814), type loc. Dalles, Columbia River, *Lewis*. *Peucedanum nudicaule* Nutt.; T. & G. Fl. 1:627 (1840). *Cogswellia nudicaulis* Jones, Contrib. 12:31 (1908). *Peucedanum robustum* *Jepson*, *Erythea* 1:9 (1893), type loc. Cannon sta., Solano Co., *Jepson*. *P. leiocarpum* *Jepson*, Fl. W. Mid. Cal. 357 (1901). Var. *PUBERULUM* *Jepson*. *Peucedanum nudicaule* var. *puberulum* Gray in herb.

22. *L. ambiguum* (Nutt.) C. & R. var. *leptocarpum* *Jepson* n. comb. Glabrous plants 1 ft. high; peduncles ascending from the root crown of the tap



35. *Lomatium nudicaule* C. & R.; a, leaf x $\frac{1}{4}$; b, fr. umbel x $\frac{1}{4}$; c, fr. x $2\frac{1}{2}$; d, sect. carp. x 4.

root which is tuberous below; leaves once or twice ternate, then pinnate, the ultimate segments linear, 5 to 10 lines long; rays few, very unequal, 1 line to 3 in. long; bractlets small, linear; flowers yellow; fruit nearly sessile, forming a dense cluster, linear or somewhat lanceolate, 4 to 4½ lines long, the wings very narrow (¼ to ½ as wide as the body); oil tubes solitary in the intervals.—Lassen and Modoc Cos.; north to Idaho, east to Colorado.

Locs.—Big Valley, *Baker & Nutting*; Jess Valley, *L. S. Smith*.

Refs.—*LOMATIUM AMBIGUUM* C. & R. var. *LEPTOCARPUM* Jepson. *Peucedanum leptocarpum* Nutt.; T. & G. Fl. 1:626 (1840), type loc. Columbia River plain near the Willamette River, *Nuttall*. *Lomatium leptocarpum* C. & R. Contrib. U. S. Nat. Herb. 7:213 (1900). *Cogswellia leptocarpa* Jones, Contrib. 12:33 (1908). *Peucedanum triternatum* var. *leptocarpum* T. & G. l. e. *P. ambiguum* var. *leptocarpum* C. & R. Rev. N. Am. Umbell. 59 (1888).

23. **L. piperi** C. & R. INDIAN BISCUIT. Plants 1½ to 5 in. high, the slender peduncles divaricate, borne on very short erect subterranean stems which rise from globose tubers 4 to 7 lines in diameter; herbage glabrous; leaves bitermately divided into linear-lanceolate segments 4 to 12 lines long; umbel 2 to 4-rayed; flowers white; bractlets narrow-lanceolate; fruiting rays 3 to 10 lines long; fruiting pedicels ¼ to 1 line long; fruit elliptic, 2 to 3 lines long, the wings ½ as broad as the body; oil tubes minute, 2 or 3 in the intervals, 4 on the commissure.—Sierra Co. to Siskiyou Co. North to Washington.

Locs.—Sierra Valley, *Lemmon*; Yreka, *Butler* 578, 1130.

Refs.—*LOMATIUM PIPERI* C. & R. Contrib. U. S. Nat. Herb. 7:211 (1900), type loc. Ellensburg, Spokane Co., Wash. *Vasey*. *Cogswellia piperi* Jones, Contrib. 12:33 (1908).

32. PASTINÀCA L.

Tall branching biennial with angular or fluted leafy stems from thick roots. Leaves large, simply pinnate. Flowers yellow, in compound umbels. Involucre and involucels small or commonly none. Fruit oval, strongly compressed. Lateral ribs winged; dorsal and intermediate ribs filiform. Oil tubes solitary in the intervals, 2 to 4 on the commissure. (Latin name of the Parsnip.)

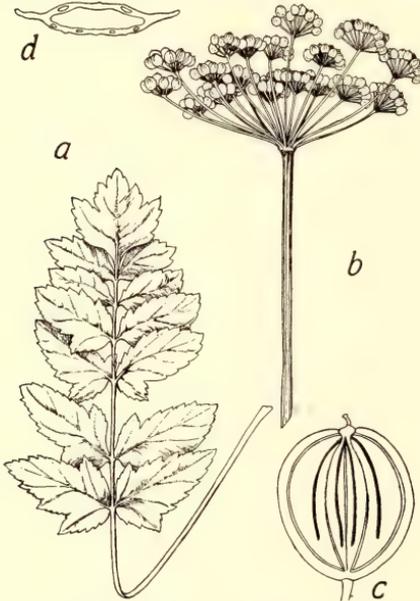
1. **P. sativa** L. COMMON PARSNIP. Fig. 36. Erect, 3 to 4 ft. high; leaflets ovate, serrate or somewhat incised, lobed or even more or less 3 to 5-divided, 3 to 4 in. long; rays 10 to 20, 1 to 2½ in. long; fruit 2½ to 3 lines long; oil tubes conspicu-

36. *Pastinaca sativa* L.; a, leaf x ¼; b, fr. umbel x ¼; c, carpel x 3; d, sect. carp. x 4.

—Cultivated European species, escaped from gardens and now locally naturalized.

Locs.—San Gorgonio Creek, San Bernardino Mts., *Parish* 1589; San Bernardino, *Parish* in 1888; Cienega near Los Angeles (*Erythea* 1:58); Boulder Creek, Santa Cruz Mts., *Harriet Walker* 834; Scott Valley, Lake Co., *Jepson*; Comptche, Mendocino Co., *Harriet Walker* 338; Sacramento, *Bioletti*.

Refs.—*PASTINACA SATIVA* L. Sp. Pl. 1:262 (1753), type European; *Jepson* Fl. W. Mid. Cal. 360 (1901).



33. ANETHUM L.

Slender annuals with leafy stems and finely dissected leaves. Flowers yellow, in compound umbels. Involucre and involucels none. Fruit elliptical, flattened dorsally, the lateral ribs narrowly winged. Oil tubes solitary in the intervals.—Species 2, Asia. (Ancient Greek name of the dill.)

1. *A. graveolens* L. DILL. ANISE. Plants usually branching, 1 to 3 ft. high.—Garden plant from Europe, locally naturalized in Southern California.

Locs.—San Bernardino (Zoe 2:28); Los Angeles (Erythra 1:59).

Refs.—ANETHUM GRAVEOLENS L. Sp. Pl. 263 (1753), type Iberian. *Peucedanum graveolens* C. & R. Contrib. U. S. Nat. Herb. 7:255 (1900), not published by Bentham and Hooker as there cited.

34. OXYPOLIS Raf.

Glabrous erect aquatic herbs with fascicled tubers. Leaves ternate or (in ours) pinnate. Umbels compound. Involucre and involucels present. Flowers white. Calyx teeth evident. Fruit flattened dorsally, ovate to obovate; dorsal and intermediate ribs filiform; lateral ribs broadly winged, the wings closely contiguous to those of the companion carpel and strongly nerved next to the body (thus giving the appearance of 5 dorsal ribs). Stylopodium short-conical. Oil tubes solitary in the intervals, 2 to 6 on the commissure. (Greek oxys, sharp, and polis, city, application uncertain, possibly referring to the many acute leaflets.)

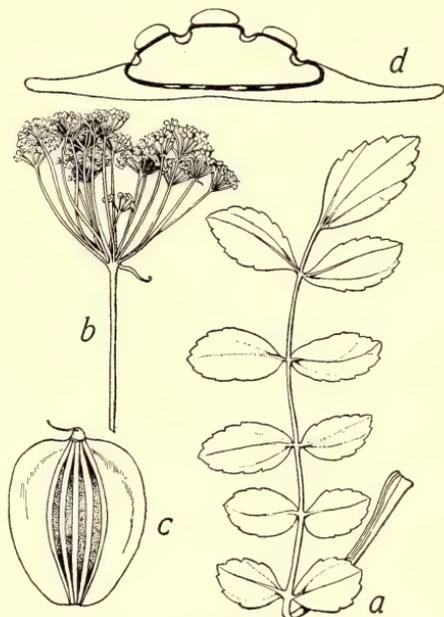
1. *O. occidentalis* C. & R. Fig. 37. Plants 2 to 3¼ ft. high; fascicled roots fusiform-fleshy; leaves simply pinnate, long petioled, the lower 12 to 20 in. long; leaflets 5 to 13, broadly ovate to linear-acuminate, serrate, 1¼ to 4 in. long; fruiting rays 1 to 3 in. long; fruits elliptic-obovate, 2½ to 3 lines long.—Sierra Nevada, 5000 to 9000 ft., Tuolumne Co. to Tulare Co.

Locs. — Silver Creek, Eldorado Co., *Kennedy* 90; Strawberry, Tuolumne Co., *A. L. Grant* 561; base of Clouds Rest, *Congdon*; Peregoy Mdw., Yosemite Park, *Jepson* 5640; Chilnualna Creek, *Congdon*; Konitz Place, Mariposa Co., *Congdon*; Keltly Mdw., Madera Co., acc. *Kennedy*; Bubbs Creek, *Jepson* 803; Giant Forest, *K. Brandegee*; Golden Trout (Volcano) Creek, *Hall & Babcock* 5443.

Ref.—OXYPOLIS OCCIDENTALIS C. & R. Contrib. U. S. Nat. Herb. 7:196 (1900), type loc. Crater Lake, *Leiberg* 4413.

35. CONIOSELINUM Hoffm.

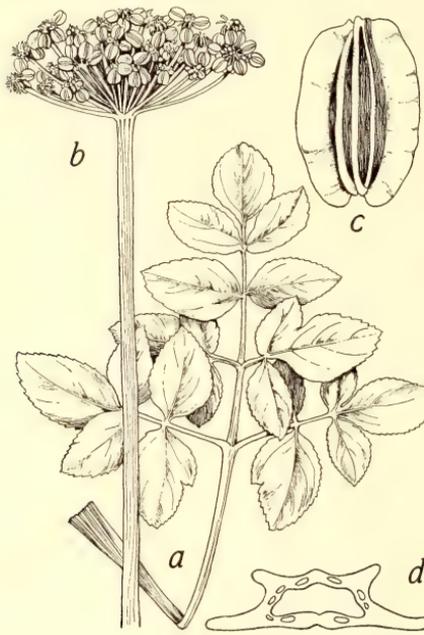
Tall branching perennials with leafy stems, glabrous herbage and ternately decompound leaves. Flowers white, in compound umbels. Involucre of few bracts. Involucels of many bractlets. Fruit oblong to obovate, flattened



37. *Oxypolis occidentalis* C. & R.; a, leaf x ½; b, umbel x ½; c, fr. x 4; d, sect. carp. x 12.

dorsally, with rather prominent stylopodium. Ribs narrowly winged, the lateral usually broadest. Oil tubes solitary in the intervals, or sometimes 2 in the lateral one, 2 to 4 on the commissure. (Greek *koneion*, the hemlock, and *selinon*, parsley.)

1. **C. pacificum** (Wats.) C. & R. Stems stout, 3 to 5 ft. high; leaves ternate, then pinnate, the 5 or 7 divisions or leaflets ovate in outline, acute, deeply pinnatifid and more or less toothed, $\frac{1}{2}$ to $1\frac{1}{4}$ in. long; umbels on stout peduncles; rays 15 to 26, 1 to $1\frac{1}{2}$ in. long in fruit; bracts 2 to 4; involucl of several narrowly linear bractlets; fruiting pedicels slender, 3 to 4 lines long; fruit oblong, 3 lines long; wings thickish and corky, rather narrow; oil tubes conspicuous, 2 on the commissure, solitary in the intervals, sunk in the body of the seed, especially the dorsal ones.—Brushy flats, Mendocino and Humboldt Cos.



38. *Angelica hendersonii* C. & R.; a, leaf x $\frac{1}{4}$; b, umbel x $\frac{1}{4}$; c, fr. x 3; d, sect. carp. x 4.

Loes.—Long Valley, Mendocino Co. (acc. *Coulter & Rose*); Indianola, s. end Humboldt Bay, *Tracy* 4388.

Refs.—*CONIOSELINUM PACIFICUM* C. & R. *Contrib. U. S. Nat. Herb.* 7:152 (1900). *Selinum pacificum* Wats. *Proc. Am. Acad.* 11:140 (1876), type *Kellogg & Harford* 315, probably collected in Mendocino Co., but said to have been "Sausalito hills"; *Jepson, Fl. W. Mid. Cal.* 355 (1901).

36. **ANGÉLICA L.**

Stout perennials with leafy stems and ternately or pinnately compound leaves. Flowers white, in large terminal compound umbels. Involucre none or scanty. Involucel of few small bractlets or none. Calyx teeth mostly obsolete. Fruit strongly compressed, elliptic-oblong in outline. Ribs prominent, the lateral broadly winged, the others often narrowly winged. Oil tubes 1 to 3 in the intervals, 2 to 4 on the commissure. (Latin *angelica*, on account of its medicinal properties.)

- Maritime species; rays subequal; herbage more or less tomentose; ovary tomentose. 1. *A. hendersonii*.
- Montane species; rays more or less unequal.
- Herbage puberulent or eventually glabrous; ovary tomentulose; Coast Ranges and coastal Southern California. 2. *A. tomentosa*.
- Herbage glabrous.
- Leaflets not linear.
- Ovary pubescent; leaflets narrow-lanceolate to ovate-lanceolate; central and northern Sierra Nevada. 3. *A. breweri*.
- Ovary glabrous; leaflets ovate-lanceolate; Siskiyou Co. 4. *A. lyallii*.
- Leaflets narrowly linear; southern Sierra Nevada. 5. *A. lineariloba*.

1. **A. hendersonii** C. & R. Fig. 38. Very stout, 2 to 3 ft. high; herbage more or less tomentose, especially on the inflorescence and under surface of the leaves; leaves quinately or ternately pinnate, then pinnate; leaflets tending to be crowded, thick, broadly ovate, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, obtuse (or rarely acute), serrate; umbels rather condensed; rays in flower subequal; fruiting rays $\frac{3}{4}$ to $2\frac{1}{4}$ in. long; umbellets dense, as if capitate; pedicels 1 line long or less; bractlets

(To be continued)

California Botanical Society

Schedule of Field Trips and Meetings

January to April, 1924

- SUNDAY, JAN. 13. Hayward Cañon. Meet at Thirteenth Street and Broadway, Oakland, 9:30 a. m. Take Hayward car to end of line. Leader, Miss Edna Finley.
- SUNDAY, JAN. 27. Vicinity of Daly City. Meet at entrance of upper waiting room, San Francisco ferry building, 9:30 a. m. Take car 14, getting off at block this side of Daly City. Leader, Miss Lucille Roush.
- THURSDAY, JAN. 31, 8 p. m. Annual meeting, 212 Wheeler Hall, University Campus, Berkeley.
- SUNDAY, FEB. 10. Tennessee Cove. Take 9:15 a. m. Sausalito boat and train to Manzanita station. Walk to beach. Leader, Dr. W. C. Blasdale.
- SUNDAY, FEB. 24. Crystal Springs and Pilarcitos Lakes. Take 8:40 a. m. electric train from Fifth and Market streets, San Francisco, to Millbrae. Leader, Mr. Herbert Mason.
- SUNDAY, MARCH 9. Sutro Hills. Meet at entrance of upper waiting room of San Francisco ferry building, 9 a. m. Take car 6 to Affiliated Colleges. Leader, Miss Muriel Pettit.
- SUNDAY, MARCH 23. Thornhill Notch. Take 8:30 a. m. Sacramento Short Line at Fortieth and Shafter streets, Oakland, to Cañon station. Leader, Professor W. W. Mackie.
- SUNDAY, APRIL 6. Cañon near Olema. Take 8:15 a. m. Sausalito boat and train from San Francisco to Tocaloma. Walk to Olema. Round trip, \$1.55. Leader, Mr. F. W. Koch.



Evening Meetings of Field Committee

All members interested in results of field trips are invited to attend.

- WEDNESDAY, FEB. 27, 8 p. m. Discussion of material collected by members on field trips. Home of Mrs. Adeline Frederick, 1201 Henry Street, Berkeley. Take car 3 going north, getting off at Eunice Street. Walk four blocks west to Henry Street.
- WEDNESDAY, APRIL 9, 8 p. m. Study of material collected on field trips at home of Mrs. Adeline Frederick, 1201 Henry Street, Berkeley.

Annual dues are payable in January. Remit to the treasurer, Mrs. Linda G. Dodd, 2636 Hillegass Street, Berkeley, California.

MADROÑO

JOURNAL OF THE
CALIFORNIA BOTANICAL
SOCIETY



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March, 1928

MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY

The purpose of this Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora; and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographical distribution of the native plants will be especially welcome.

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Botany Building, University of California,
Berkeley, California

GEORGE J. PEIRCE,
Stanford University

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at Los Angeles

CALIFORNIA BOTANICAL SOCIETY

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THE CALIFORNIA BOTANIC GARDEN

ELMER D. MERRILL

Botanists have long realized that the climatic conditions in California are such that most favorable conditions exist in many parts of the state for the development of botanical gardens. It has long been hoped that somehow, somewhere, such an institution might be established on such a basis that it might be reasonably expected to develop into a plant science research institution, equaling the great botanical gardens of the Old World and of the Central and Eastern United States. There is now distinct promise that such an institution will be developed in Los Angeles as the California Botanic Garden.

Certain public spirited men in Los Angeles pooled their interests in 3200 acres of land located in the Santa Monica Mountains, fifteen miles from the center of the city, and deeded the entire property to the Garden Foundation, Incorporated. The Foundation is a non-stock, non-profit association organized under the laws of California which permits such organization for certain charitable, educational and scientific purposes, and was created specifically to provide for the establishment, development and maintenance of the botanic garden. The personnel of the Garden Foundation consists of E. D. Merrill, Arthur Bent, H. C. Oakley, H. O. Davis, John Treanor, A. E. Bell, H. H. Braly, Shepard Mitchell and R. C. Gillis. In order to finance the proposition a bond issue of \$2,500,000 was sold and the property and proceeds of the bond issue were placed in trust with the Metropolitan Trust Company of California for the benefit of the Botanic Garden.

The tract is situated near the city of Santa Monica, extending from Beverly Boulevard on the south to Mulholland Highway on the north, ranging in altitude from four hundred to two thousand feet above sea level. It entirely surrounds Mandeville Cañon and includes its delimiting ridges. The plan of development calls for the setting aside of somewhat in excess of 800 acres forming the entire floor and lower slopes of Mandeville Cañon as the Botanic Garden, and the subdivision and sale of the surrounding acreage for residential purposes. The garden area will be delimited by the garden boulevard, and this area, under the Declaration of Trust, will remain inalienable in perpetuity, to be devoted to the purposes indicated, that is, a botanic garden. Owing to the topography of the region the garden will be totally different from the similar great institutions that have been developed in and near other large cities.

The California Botanic Garden is today heavily endowed in land. The present problem of the Garden Foundation and the Metropolitan Trust Company is to convert a part of the land endowment into productive funds, for the purpose of retiring the bonds already sold and providing a funded endowment that will ensure the proper development and future support of the garden. In ultimate analysis the future success of the California Botanic Garden depends on the success of the

contemplated subdivision, for under the terms of the trust agreement all profits from the real estate transactions are to form the endowment of the institution. Any development in the immediate future must be financed from the bond issue, and funds so expended are of course a charge against the future funded endowment of the California Botanic Garden.

It is planned to develop the garden on the basis of the vegetation at present existing in Mandeville Cañon, and fortunately the native vegetation of the cañon is largely undisturbed. Among the trees the sycamores and oaks are well developed, and there is a great wealth of herbaceous plants and shrubs in the cañon and on its slopes. The first plantings will of course be at or near the south end of the tract contiguous to Beverly Boulevard. The climatic conditions are most favorable, as certain parts of the area are frost free, while the cañon is protected against heavy winds. While presumably formal plantings may be stressed at and near the main entrance of the garden, the plantings over most of the area will be informal in nature. The numerous lateral ravines, varying slopes and exposures, render the area particularly suitable for informal treatment. Likewise, there is a great range of possibilities in developing regional gardens as well as special features, such as a cactus garden, a succulent garden, collection of roses, iris and bulb plants.

The H. C. Oakley estate, which will ultimately form a part of the Botanic Garden, is already highly developed, the plantings containing a great wealth of subtropical plants that thrive under the conditions there existent. Here are numerous species of mature palms; various tropical and subtropical ferns, including tree ferns from Australia; a number of subtropical fruits as yet rare in other gardens in California; a large collection of bamboos; a great variety of flowering shrubs, vines and trees; while the banana regularly ripens its fruits in the Oakley garden.

It is planned to develop the California Botanic Garden as a plant science research institution on a broad basis, making it one covering world botany rather than as an institution devoting its energies to a study of strictly local problems. This will involve the immediate construction of an administration building, the equipment of laboratories, the building up of a general reference library, the assembling of a comprehensive collection of botanical material in the form of an herbarium, the establishment of technical and popular periodicals and the selection of the necessary technical staff. In pursuance of the general plan of developing the institution and indicating in some measure its potential field, plans have already been evolved for prosecuting field work in foreign countries and it is expected that within a few months actual exploration on behalf of the new institution will be in progress in from twelve to fifteen different regions. The development must of course be gradual but the California Botanic Garden, now an established institution, is potentially a highly endowed one, which in due time should take its place among the great institutions of its kind in the world.

609 South Grand Ave.,
Los Angeles, June 17, 1927

THE HYPOSTASE AND SEED STERILITY IN THE ONAGRACEAE

DONALD A. JOHANSEN

Numerous species of the Onagraceae (Oenotheraceae) present a high degree of ovular sterility which is difficult to explain. This is well known to all research workers on the Onagraceae and was forcibly brought to my attention the past year during investigations on *Clarkia elegans*. It was extremely exasperating to be forced to discard slide after slide which should normally show either mature embryo sacs, syngamic stages or zygotes but which exhibited merely empty embryo sac cavities. The ovaries were taken from pedigree cultures; no seed germination studies have been carried out, but the slides show that sterility is widespread and more than a purely genetical phenomenon.

An attempt was naturally made to ascertain the cause of this extensive embryo sac abortion. It early became apparent that the cause was to be found in physiological rather than genetical disturbances. The most commonly accepted theories to account for ovular sterility were discarded as being incapable of experimental proof.

The ovules of other species of the Onagraceae were examined and compared with those of *Clarkia elegans*. The investigation had not proceeded far before it was discovered, by personal observation and a review of the literature, that seed sterility was absent in those species which lacked the so-called "hypostase" of van Tieghem. What was previously merely a vague suspicion became a foregone conclusion: there was an intimate connection between the presence of a hypostase and seed sterility.

The hypostase was first described in 1893 by Ph. van Tieghem.¹ He first designated the structure under consideration as the "cupule lignifiée." However, it was of such general occurrence and assumed such varied characteristics that a comprehensive name designed to embrace all manifestations was proposed in the name "hypostase." Two other papers by van Tieghem on the hypostase appeared later.^{2, 3} Outside of a brief discussion by Ishikawa,⁴ the subject has been completely ignored by botanical investigators.

As far as the present note is concerned it is unnecessary to go into a detailed discussion of the hypostase; all that is required is an understanding of what constitutes the hypostase in the ovule of the Onagraceae. Briefly, it consists of a well defined but irregularly outlined group of thick-walled cells at the chalazal end of the ovule, situated directly on top of the end of the vascular bundle entering from the raphe, and which ordinarily but not invariably extends to the base of the embryo sac. The cells are filled with a substance which stains intensely with the usual chromatin stains and with chlorophyll solution. Ishikawa concludes it is an ultimate substance, though he repeatedly and erroneously calls it a "chromatic substance." The hypostase

¹ Bull. de la Soc. Bot. 40: 347. 1893.

² Bull. du Mus. d'Hist. Nat., Paris 7: 412-418. 1901.

³ Ann. Sci. nat. Bot. VIII, 7: 347-362. 1903.

⁴ Ann. Bot. 32: 279-317. 1918.

stains so brilliantly that it cannot be overlooked if present. The inner integument is directly continuous with the hypostase. However, there is a sharp distinction between the two; the former is a definite structure while with the latter, indefiniteness of extent is one of its main characteristics. Moreover, the deposition of a substance in the cells of the inner integument occurs whether or not a hypostase is present.

Properly speaking, the hypostase can hardly be called a structural unit of the ovule since the cells without their peculiar contents are indistinguishable from the surrounding cells not a part of the hypostase. Rather, it is a definite portion of the ovule in which the metabolic processes of the entire intraintegumental region are concentrated. That is the only conclusion which the facts permit. The limits of expansion of the hypostase are quite well defined though not structurally delimited at every point.

The hypostase makes its appearance quite early in the life of the ovule — usually just preceding the first meiotic mitosis. It rapidly becomes functional and is the sole arbiter of the destiny of the embryo sac. Its functional balance is presumably very delicate; it appears that once a violent disturbance occurs, recovery is impossible. In ovules possessing a hypostase, all nutritive materials intended for the developing embryo sac must pass through that region. Entrance of these food materials may be effectively blocked by changes in the cells comprising the hypostase, with the consequent death, degeneration and disappearance of the embryo sac previous to syngamy. The nature of the functional disturbances in the hypostase is a moot question; whatever their nature, they are of vital importance in the development of the seed.

The possible causes may be briefly summarized as follows: (1) the cell walls may become so thick as to form an impervious barrier; (2) environmental influences, such as sudden rises in temperature, excessive drought, etc.; (3) temporary stoppage of the food supply to a particular ovule; (4) some substance inimical to the metabolic function may be formed or deposited in the cells; (5) the stimulation effected by fertilization may be required for the continued functioning of the hypostase; (6) the tendency towards possessing a non-functional hypostase may be dominant and hereditary in some degrees.

In ovules in which the embryo sac had entirely disappeared, presumably thru the non-functioning of the hypostase, one of the most noticeable effects was the abnormal development of those portions of both integuments surrounding the raphe. In many cases there was an astonishing increase in size (often as much as ten times normal size) of the two layers of cells of the outer integument. The obvious explanation is that the food intended for the embryo sac never reached it and was deposited in the integuments with consequent hypertrophy of the latter. Such ovules when matured have about the same size as normal seeds containing embryos, but naturally do not germinate. In other cases the nucellar cells are shrunken and that side of the ovule opposite the raphe is crushed inwards. Among collected seeds these

latter constitute the powdery "seed-like structures" mentioned so often by Davis and other workers on *Oenothera*.

Oenothera, *Gaura*, *Clarkia*, *Eucharidium* and *Circaea* possess definite hypostases, while *Ludwigia*, *Jussiaea*, *Godetia* and the majority of species of *Epilobium* and *Fuchsia* are characterized by its absence. The first group is notorious for the presence of tiny, malformed seeds incapable of germination, while such are practically unknown in the latter group. For *Zauschneria*, *Lopezia* and *Boisduvalia*, there is no data regarding the presence or absence of hypostases; all three are said to have wholly fertile seeds, hence one may conclude that these lack a hypostase.

In conclusion the author holds that germination tests of seeds of species of the *Onagraceae* possessing a hypostase in their ovules are of no significance or value whatever, for reasons which are so obvious that they need not be elaborated.

Department of Botany, Stanford University
July 24, 1927

THE BOTANICAL EXPLORERS OF CALIFORNIA.—I.

WILLIS LINN JEPSON

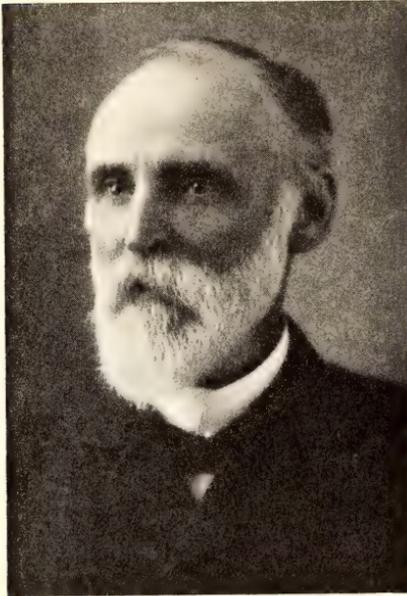
Definite botanical exploration of California has been proceeding for something like one hundred and forty years. More or less of the field work of the earlier explorers has been made a matter of printed record. The interval of the last fifty years covers a period represented by much devoted field work on the part of certain men who have passed away without mention or with only scant notice. Without exception these collectors contributed results of their field studies and material from their collections unstintedly and widely, more especially to those engaged on major botanical tasks. It has appeared, therefore, unfitting that the men who had in this way done much to promote the progress of systematic botany in California and North America should pass on without a word of memorial. It is not difficult for anyone with some gift of expression to write a felicitous appreciation of personality and character, and this is well worth doing. However, it has seemed to the writer that a real memorial should rather bring together the essential facts in regard to the life of the explorer and the important information regarding his field work in a permanently accessible form. Research men in systematic botany raise almost endless questions in regard to the field of operation of a botanical collector and his plant materials. A memorial, therefore, which is useful for reference seems the kind worth making. A sound view this, we think, but how difficult to realize! Facts, as is well known, are exceedingly expensive to assemble, and in a given case their assembling may not prove feasible. Information which might readily be had in a collector's lifetime, is lost with his death. When an explorer is no longer living it is often disconcertingly difficult to make a record of his collecting expedi-

tions, which is of geographic significance, and the years when the work was done. In these tributes which follow, this main purpose of a useful memorial has always, nevertheless, been kept steadily in mind though so imperfectly attained.

Volney Rattan

In the spring of 1877 a girl in the botany class in the Girls' High School in San Francisco held up her hand one afternoon and asked a question. The instructor, in answer, went to the blackboard and quickly made a drawing. Never before had there been a teacher in that school who could make blackboard drawings with so skillful and sure a hand; never before had there been a teacher who had so much interest in botany. These young girls of the school grew in time to be women—and remembered. When, thirty years later, at a reunion of the alumnae of the San Francisco Girls' High School the name of Volney Rattan was mentioned, it was greeted with prolonged applause.

Volney Rattan was born near Madison, Wisconsin, on May 23, 1840. He was educated in the country schools of Wisconsin and Iowa, and had three years, 1857 to 1860, in the University of Wisconsin.



VOLNEY RATTAN

After leaving the University he came by the Overland Trail to California in the spring of 1861 and settled in Placerville, better known to the un-hypocritical argonauts as Hangtown. In those early days the Sierra foothill towns were centers of importance where Horace Greeley spoke and Edwin Booth played Hamlet. So in Placerville, Rattan found work to his hand in the county's public schools. One day there came into Rattan's office a young man who desired to teach. Rattan on the spot examined him on English and grammar, then he sent him to one of the members of the School Board, a business man, to be examined on arithmetic, after which Rattan took down a plain sheet of paper from a pigeon hole and certified that C. W. Childs was qualified to

teach in the public schools in California. We must remember that in that early day in California education itself was still respected and valued. There was a general and deep-rooted prejudice in the

community that it was a highly desirable thing to have an education if you could get it. The schools, as a consequence, attracted really able men. Growing youth were held to be an important care; and files, pedagogical methods, correctly printed forms, palatial buildings, pupil activities, commercialized athletics and honor systems were quite unknown. The generation was too busy, all of it that could, in getting an education, to care about non-essentials or to think of making them the main thing. One of the great leaders in promoting education turned out to be this C. W. Childs, whom Volney Rattan started safely and securely on his way to become at a later time, the President of the California State Normal School at San Jose.

In this same connection Rattan himself is worthy of honorable mention. He did important work as a teacher of science in the Santa Cruz High School from 1873 to 1876 and in the Girls' High School, San Francisco, from 1876 to 1889. In 1889, President Childs, knowing well the excellent record of Volney Rattan, and also remembering Hangtown, called him to teach botany in the State Normal School. Here Rattan remained until 1906, the date of his permanent retirement.

Volney Rattan had gifts as a teacher. One of his old-time students at the Girls' High School in San Francisco, tells me that he readily inspired lasting interest in the subject of botany. He was in particular a facile blackboard artist and could illustrate, quickly and effectively, details of habit or a principle of plant structure. After his retirement from the Normal School he lived in Berkeley, where he died March 4, 1915. He was a courteous fine-grained gentleman; although so unobtrusive and modest in his ways, nevertheless a deal of silent homage was his. It can well be said that in those early days he did more for botanical teaching in the public schools and for wide diffusion of interest in the native flora amongst the people of California than any other man. His "Popular California Flora" was well suited to its purpose and it has given to thousands of Californians a pleasure in the fields and forests which they associate with their earliest experience of wild life. In some ways a matter of fact and practical book, yet it had an engaging interest and even charm, due mainly to the many excellent old-time wood engravings made after Volney Rattan's own drawings.

The first edition of the "Popular California Flora" appeared in 1879 and was published by the celebrated San Francisco firm of Bancroft. It consisted of 106 pages and included only the common exogens. In the second edition (1880, 138 pages) the common endogens were added. Editions 3 and 4 followed in 1882, edition 5 in 1883, edition 6 in 1885, edition 7 in 1887, edition 8 in 1888. He also issued in 1887 "An Analytical Key to West Coast Botany containing descriptions of Sixteen Hundred Flowering Plants growing west of the Sierra Nevada and Cascade crests, from San Diego to Puget Sound." There was a re-issue of this in 1888, followed in 1898 by "West Coast Botany, an Analytical Key to the Flora of the Pacific Coast in which are described Eighteen Hundred species of

Flowering Plants from San Diego to Puget Sound" (pp. 221). All of these editions are in my botanical library. He also issued in 1897 a small book entitled "Exercises in Botany for the Pacific States" (pp. 120).

One of Rattan's interests was associated with the California Floral Society. As a result of this interest he contributed a Botanical History of the *Eschscholtzia* to Emory E. Smith's book, *The Golden Poppy* (pp. 9-12,—1902). I have no records of other writings except a paper in the *Botanical Gazette* (vol. 11, p. 338,—1886), in which he describes as new two species of California plants, *Campanula exigua* from Mt. Diablo, and *Gilia ambigua* from Oak Hill, four miles south of San Jose, both of which we now know to be rarities and easily overlooked.

Rattan collected chiefly near his places of residence, except that in his vacations he developed a great interest in the region of the North Coast Ranges which he explored for many years. There are no definite and clear records of his expeditions into this region in successive years. He traveled with a light buggy and single horse, or in the rougher mountains with pack animals. It was largely a virgin region to the foot of any botanist and the fruits of his collecting were notable. His first expedition was made in 1878. A lumber steamer took him to Crescent City where he bought a pack horse and set out into the mountains, following the trails, never the roads. On one occasion, in June, 1884, starting from the upper Sacramento Valley he entered the Coast Range foothills by way of Stony Creek and thence made his way across the mountains westerly to the ocean. On this expedition he collected *Euphorbia Rattani* Watson, *Gilia Rattani* Gray, *Mimulus Rattani* Gray and *Phacelia Rattani* Gray, and re-gathered such rarities as *Schizonotus purpurascens* Gray (*Solanoa purpurascens* Greene). He was on the Klamath and Trinity Rivers and Humboldt ridges in 1878 and 1879 at which time he collected *Collinsia linearis*, *Collinsia Rattani* and *Pentstemon Rattani*, all published as new by Asa Gray. The flora of the river basins of Humboldt County engaged his attention in 1882 and 1883, and in previous and later years of which I have no satisfactory records, he was steadily exploring various parts of the North Coast Ranges.

The biological spirit was well developed in Volney Rattan, his acute preceptions leading him to an abiding interest in the life history of the native seed plants. Amongst his interesting field studies may be mentioned the peculiar germination of *Echinocystis* which Charles Darwin acknowledged and illustrated in his "Power of Movement in Plants" (Appleton ed., 1881, p. 82).

Berkeley, Jan. 10, 1920.

MADROÑO

JOURNAL OF THE
CALIFORNIA BOTANICAL
SOCIETY



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June, 1928

MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY

The purpose of this Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora; and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographical distribution of the native plants will be especially welcome.

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University of California
at Los Angeles

CALIFORNIA BOTANICAL SOCIETY

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BRINE AND BRINE ORGANISMS

GEORGE J. PEIRCE

Within the limits of the State of California the natural waters range in hardness from the softness and purity of rain and melting snow to hardness such that one can drive upon them in automobiles. In the high granitic regions of the Sierra Nevada, the water in streams and springs is so pure that one can use it, in case of necessity, in the batteries of one's automobile. In the southeastern corner of the State, Searles Lake, in San Bernardino County, is a solid mass of salt, dry only at the immediate surface. Between these two extremes are the connecting links. In addition, there are natural waters so charged with poisonous material that they can be drunk only as a step to death, and so hot that only a very few organisms are able to survive in them.

The salt waters are of two origins, marine and land. Along the shore of San Francisco Bay, and on various other flat parts of the coast line, one finds salt works where common salt is made by crystallization from the sea water, concentrated by natural evaporation. Along the eastern foot of the Sierra Nevada is a chain of desert basins, the survivors of the great prehistoric Lake Lahonton. The lowest of these, Death Valley, is in the main waterless. The others contain lakes of varying size and consistency, at different altitudes above sea level.

Both in the brines originating from sea water, and in the brines of inland origin, one finds algae and bacteria living under fatal conditions. The structure and behavior of these unicellular organisms, and the extraordinary conditions under which they live, have interested me for years. One speaks of the conditions which make life possible, and conditions beyond these are considered fatal. Nevertheless, we find plants living at fatal temperatures, in fatal concentrations, and in solutions of fatal compositions. The physiologist naturally asks: What makes this possible? Is it a matter of permeability or impermeability; of contents, in which ordinary reactions do not take place; of mechanical resistances as extraordinary as any of the other features of these remarkable cells? Yet these cells are very similar in shape, size, and general appearance to the cells of algae and bacteria living under more usual conditions. The algae and bacteria in these brines are unicellular; but there are animals—crustaceans and insects—which are multicellular and these have a very considerable degree of development, both anatomically and physiologically.

One associates with algae the power of combining CO_2 and H_2O to form sugar and starch. The green, brown, red and bluegreen algae all do this in ordinary waters; but in saturated brine, from which common salt is crystallized in commercial quantities, there is no carbon dioxide. From carbonates and bicarbonates, therefore, these

unicellular and motile algae must be able to secure all the carbon they need. Thus the long and historical struggle, finally won by Liebig, the chemist, and Sachs, the plant physiologist, who thought they showed that all the carbon of the usual green plant comes from the carbon dioxide of the air, has proved to have been unnecessary and its conclusion to a certain extent erroneous. As a result of the study of concentrated brines and of sea water, one comes to realize the reason for the extraordinary density of population between the tide marks, namely that there the carbonates and bicarbonates and carbon dioxide are sufficient to maintain a great population.

One associates oxygen with breathing and respiration. At the edge of the sea between the tide marks on rocky shores the waves, beaten by contact with rocks and cliffs, enclose and dissolve much oxygen; but the concentrated brines of marine and inland origin contain insufficient amounts.

The bacteria of decay in the brines are able to attack only, or at least mainly, the lifeless remains of other brine organisms; but it must be admitted that a considerable number of these destructive bacteria are able to break down proteins and other complex compounds originating in meats and in some other organisms living on the land. This may be a part of the explanation of the "embalmed beef" of evil reputation in the Spanish American War, and possibly of scurvy, among both adults and children. But, on the other hand, there are bacteria living in these brines which are independent of other organisms for the carbon and other indispensable elements of their food. If they are able to absorb enough energy from the light, they effect such rearrangements of carbon and other elements as result in the production of very considerable amounts of organic matter. Thus, old brines contain deposits of organic matter manufactured by the autotrophic bacteria living in them. Some of these autotrophic bacteria produce a magnificent Tyrean purple color, others produce different shades of red; but all of these pigments permit the passage of red rays, at the same time absorbing others which the bacterial cells use in the manufacture of food and fuel for themselves.

Owens Lake, the salt lake next north of Searles Lake, was covered when I visited it with a soft crust, through which one broke as one walked, leaving footprints red in color. They offered an astonishing contrast to the snow-whiteness of the soft crust and the brilliant blue of the desert sky, the most extraordinary combination of the three colors of the American flag which I have ever seen. Other red-forming bacteria living in marine brines are caught on and in the crystals of salt employed in preserving cod fish and, under favorable conditions, convert the salt cod fish into a striking red mass, the disagreeable taste and smell of which makes them unsaleable rather than unpalatable or injurious. Pure cultures of these red bacteria have been grown, and sterilized salt cod fish infected with them turn red in the cultures. A preservative may therefore carry its antidote with it, and the commercial caption "Sterilized Salt" is not as foolish

as it sounds. The carrying of coals to Newcastle is not always unjustified.

North of these two lakes and at somewhat higher altitudes, at the foot of one of the passes leading to Yosemite Valley at its western end, is Mono Lake, famed for its saltness; but which has not yet been accessible to me at the best time to visit it, namely, at the end of the dry season or immediately before the snows and rains of winter begin. Still farther north in the Carson and adjacent valleys one finds a great variety of springs, hot, mineral, poisonous, with larger and smaller accumulations of water and contents; and, within convenient distance, three large lakes with fresh water entering at one end, but the waters at the opposite end at least brackish, if not pronouncedly saline.

In the country adjacent to Fallon, Nevada, are various salt accumulations, dry or still wet. Many of these take the form which the geologists call playas. One of these, Soda Lake, is covered with a crust, barely strong enough to support a man of average weight. Except for involuntary breaking through, such as one might experience on a pond not yet frozen hard enough for safe skating, one must use a pick of some sort to get through the crust. When one does so one penetrates a mass of white salt, with large and glittering crystals on the underside, bathed in a liquor of astonishingly brilliant red color, approaching crimson in its blueness but still possessing enough of the red to deserve the name of Tyrean or royal purple.

Pyramid and Winnemucca lakes, dividing the surplus waters of the Truckee River not used for irrigation, are great inland seas, miles long and slowly shrinking,—their islands, the homes and breeding places of pelicans; their waters, extraordinarily interesting to the student of fish, especially for their trout, living and breeding in the half of the lakes below a certain concentration, and avoiding the further stretches removed from the stream which supplies fresh water. This stream, the Truckee River, is the outlet of one of the most magnificent bodies of fresh water in the world. Surrounded by high peaks, snow-clad for a good part of the year, once covered with a heavy growth of forest, years ago cut off to supply timbering for the mines of the Comstock lode, Lake Tahoe is intensely blue or wonderfully green, according to the bottom. Passing out through the control gates into the Truckee River, its water becomes one of the famous fly fishing streams of the world and farther down gives its power to various manufacturing and electrical establishments. It is distributed over what would otherwise be desert areas, which are thereby made correspondingly productive, and the residue goes to Pyramid and Winnemucca Lakes, past an extensive Indian Reservation. Both in the waters of these lakes and along the shore the vegetation shows the character of the water,—near the intake, carrying only a small load of dissolved salts and, at the opposite end, forming a spray which on drying whitens the shores. Somewhat farther south is a very similar lake set in the desert, its blue

waters presenting an extraordinary contrast to the high and otherwise waterless sandy plain, bounded by mountains to the west and extending almost indefinitely eastward. Here also one sees the pelicans with their striking white plumage; but except one drive for a long distance and risk missing the infrequent train, one cannot reach the end where the waters are truly saline.

Still farther north, in northeastern California and eastern Oregon, more of these salty lakes are known; but I have not seen them yet.

In the most concentrated brines of inland origin one does not find the curious *Artemias* (crustaceans) which are present in Great Salt Lake and in the salterns on the shores of San Francisco Bay and apparently in similar situations elsewhere. Nor does one find the same species of algae or bacteria. There are no bluegreen algae in the concentrated brines of the San Francisco Bay region. Whether they are present in Great Salt Lake or not I do not know. There are no green algae in the crust of Searles Lake, but at about a centimeter and one-half below the surface of Searles Lake one comes to a layer first of yellow then of pale, bluish green cells which change to green at the bottom. A stratum in which bluegreen algae occupy the zone of optimum illumination, and in which the supply of water is still sufficient to meet this need, one must imagine a solution saturated with the salt which makes up the major part of the deposit which it wets and in which it is contained, carrying also other salts as long as the concentration permits. These liquors, containing potassium, magnesium, sodium and, in smaller proportions, boron and many other elements, constitute solutions of extraordinary physical and chemical properties, of such osmotic pressure that one must conceive the little organisms inhabiting them as being either freely permeable to these salts or else of such mechanical strength that they can resist almost any pressure. It is perfectly evident too that the resistance of these organisms and solutions to temperature is most unusual. Manifestly, the concentrated solutions will freeze only at temperatures far below the freezing point of pure water; but they will absorb from the sun still more heat than pure water, and consequently on a summer day may have a temperature much higher than that of ordinary water similarly situated. Thus, I have found the water in the salterns of the commercial salt works on San Francisco Bay surprisingly warm to the hand; and while the thermometer indicates a temperature quite below that which would be injurious, nevertheless it is far higher than the usual optimum for algae. They must, therefore, be able to resist these high mid-day temperatures of summer and, on the high cold plateau at the western foot of the Sierras, the bitter temperatures of mid-winter. One must realize too that these algae and bacteria must either adjust themselves with extraordinary rapidity to a great change in the concentration of the water when rain falls or melted snow flows upon them in one of these salt accumulations or die; that the mortality in the concentrated brine is enormous, as indicated by the observations which I have made on the salterns in San Francisco Bay, for when the rains come

the fresh water, falling on the surface of the much heavier brines, stays on the surface, unless the winds interfere, until a gradual diffusion brings about a distribution of the added waters. Death does not seem to result from bursting, as one might expect, but from distension, which produces mechanical injuries to the structure of a living cell from which it cannot recover. What is actually accomplished by the pulling apart of the solid constituents of the colloidal complex which we call living protoplasm, no one can yet tell. But we can imagine or even set up mechanical models and on these observe the result of such changes as are effected by differences in the amounts of water supplied to and contained within the cells.

The above sketch of what we have learned by the studies of brines and their contents, by a group of men interested in them at Stanford, leads us to hope that the continued investigation of the organisms living in extraordinary environments will throw considerable light upon the actual conditions of life and the physical and chemical conditions prevailing in living organisms.

Stanford University,
December 9, 1927.

THE BOTANICAL EXPLORERS OF CALIFORNIA.—II.

WILLIS LINN JEPSON

Joseph Whipple Congdon

The lower Santa Rosa Valley in the year 1880 presented a rather different aspect from that of the present day. The level plain, stretching northerly from the marshy tule-inhabited shores of San Pablo Bay, was filled with fields of wheat and barley, diversified here and there by wild bits of land where the native flora still persisted rankly and made fine botanizing. In the spring and summer days of that year, a botanist, earning a livelihood as a lawyer in the neighboring village of Petaluma, searched the fields and hillslopes for interesting plants. One day, July 1, 1880, his eager gaze discovered a gray plant in the grassy formation which he knew belonged to the Borage family but seemed unusual. The specimens which he gathered came eventually into the hands of Professor Edward Lee Greene who named the plant as new, *Allocarya vestita*, in the botanical journal *Erythea* (3:125,—1895). It was the first of a long series of interesting discoveries to be made by Joseph W. Congdon, who continued to explore California for a life-time. His career had many points of interest and we now set down what is known of it.

Joseph Whipple Congdon, whose father was of Quaker stock, was born in Pomfret, Connecticut, April 12, 1834. He entered Brown University and graduated at the head of his class in 1855. After leaving college he turned to teaching as a stepping stone to law, was admitted to the bar in Providence, Rhode Island, in 1860, and practiced there until 1879. In 1878 and 1879 he was a member of the Rhode Island House of Representatives. He came to California in 1880, taught school for a short time as so many young

lawyers have done before him and since, and then practiced law the remainder of his life, or nearly. The study of botany was, however, always an absorbing recreation. Under the influence of his aunt, Frances H. Green, he had developed at a very early age a strong interest in plants and at a later time, in collaboration with her, he published a Class Book of Botany, an effort which antedated the first edition of Gray's Lessons (1857). It is an interesting old-time text. The title-page bears the motto, Science is only the interpreter of Nature.

In California he was known as a keen-eyed collector and obtained many rare or local plants overlooked by others. A few interesting examples may be noted.



JOSEPH WHIPPLE CONGDON

He discovered *Eleocharis rostellata* Torr., at San Francisco (not otherwise known outside of Southern California and the desert), *Salicornia europea* L. at Palo Alto, and *Carex viridula* Michx. at Inglewood Swamp, Mendocino County. While he collected at scattered localities in the state, for the most part his collecting was done in the neighborhood of his places of residence. He was at Petaluma practicing law for about a year in 1880, at Visalia teaching in 1881, and finally again resumed the practice of law and made his home at Mariposa town from 1882 to 1905. From this center he botanized thoroughly the region of Mariposa County and every summer for many years made a collecting trip to Yosemite or to the High Sierras above Yosemite. He was on the summit of Mt. Warren, Mono County, a high peak (12,337 feet) east of the main Sierran axis, on August 26, 1894. His duplicates were generously and widely distributed. A large number of his plants are in the California and Stanford herbaria. After his death his herbarium of about 10,000 sheets was purchased, through the interposition of Dr. Frederic Clements, from his widow by the University of Minnesota which realized for her the sum of \$250.00.

Like many devoted students of natural history Joseph Congdon was of very unworldly temperament and altogether too modest and retiring to make a lawyer, at least a financially successful one. He was by nature a quiet student and had a gift for languages. It is said that he read seven languages and spoke five. The study of Latin was begun at nine years of age, so that he got a good start. He died

April 5, 1910, at Waterman, Washington. The following California plants will help to preserve his memory: *Mimulus Congdonii* Robinson; *Carex Congdonii* Bailey; *Godetia viminea* var. *Congdonii* Jepson; *Eriophyllum Congdonii* Brandegee; *Ribes Congdonii* Heller; *Eatonella Congdonii* Gray; *Trisetum Congdonii* Scribner & Merrill; *Carex Congdonii* Bailey; *Lomatium Congdonii* Coulter & Rose; *Sedum Congdonii* Eastwood; *Astragalus Congdonii* Watson. In the Manual of the Flowering Plants of California the writer dedicated to him the Crassulaceous genus *Congdonia*, based on *Sedum pinetorum* Bdg.

The following list contains all of his writings known to me and probably all that are of essential interest: Analytical Class Book of Botany (Part I. Elements of Vegetable Structure and Physiology by Frances H. Green. Part II. Systematic Botany; Flora of the Northern States by Joseph W. Congdon. 1855). Mariposa County as a Botanical District (*Zoe*, 2: 234-236,—1891; 3: 25-43,—1892; 3: 125-131,—1892; 3: 314-325,—1892). Views of a working botanist on the new American Rules of Nomenclature (*Zoe*, 3: 339,—1892). Some California Plants (*Zoe*, 5: 133-135,—1901). New Species, Principally from Mariposa County, California (*Erythea*, 7: 183-189,—1900). A New Lupine from California (*Muhl.* 1:38,—1904). Appreciative notices of his life appeared at the time of his death in the *Seattle Daily Times*, Apr. 16, 1910, and *The Evening Bulletin*, Providence, Rhode Island, May 4, 1910.

Berkeley, February, 1921.

THE ANNUAL DINNER FOR 1927

The Society met for the annual dinner on Saturday evening, February 12, 1927, in the Student Union on the University of California campus. Dr. W. W. Robbins of the Davis branch of the College of Agriculture of the University of California presided as toastmaster. Mr. Anson S. Blake discussed the possibilities of a native plant reserve on Howell Mountain to be kept in its natural condition. The problem of botany versus "biology" in the high schools of California was pleaded by Mr. F. W. Koch, head of the Science Department in the Galileo High School, San Francisco. Brine organisms was the subject of a short discourse by Professor George J. Peirce of Stanford University. Professor J. H. Priestley of the University of Leeds, England, talked of the pleasures of botanical travel in California. The Society paused for a moment in its regular program to give salutation to Mr. S. B. Parish, who had recently celebrated his eighty-ninth birthday. The main address of the evening was a lecture upon the botanical results of the Third Asiatic Expedition, illustrated by motion pictures, given by Dr. R. W. Chaney of the Carnegie Institution. After the lecture a reception was tendered Mr. and Mrs. Priestley. Music was provided under the direction of the Society's musician-laureate, Mr. W. W. Carruth, of Oakland. There were seventy-six members present.—
W. L. JEPSON.

NOTES AND NEWS

Work in Botany during the Summer Quarters of the next few years at Stanford University, and at the Hopkins Marine Station of Stanford University at Pacific Grove, is contemplated as follows: In 1928 and 1929 a physiologist at Stanford, a morphologist and a physiologist at the Hopkins. In 1930 a physiologist or morphologist at Stanford, probably both at the Hopkins. In 1931 a systematist at Stanford, probably a physiologist and a morphologist at the Hopkins. In 1932 an ecologist at Stanford and the usual staff at the Hopkins.

Attention may also be called to the new Jacques Loeb Laboratory of the Hopkins Marine Station, devoted to the physiology of plants and animals, where instruction and research will be carried on as soon as the laboratory building, now under construction, is completed, presumably in June, 1928.

Dr. William Newton who has been assistant professor of Botany at the University of California at Los Angeles left the first of the year (January, 1928) for Agassiz, British Columbia, where he will be a plant pathologist of the Dominion Department of Agriculture. His particular work will be on the virus diseases of truck crops.

Dr. Arthur Monrad Johnson who was at the University of Minnesota until 1924, is lecturer in Systematic Botany at the University of California at Los Angeles for the year 1927-28. He is preparing a monograph of the genus *Saxifraga* and a revision of the genus *Helianthus* of North America. While in Minnesota he worked on the flora of the Minnesota National Forest.

Dr. Carl C. Epling, assistant professor of Botany (Systematic) at the University of California at Los Angeles, is at Kew, England, on leave from the University for the year 1927-28.

Collections of fossil plants from the Oligocene sandstone along the Pacific Highway, one and a half miles south of Goshen, Oregon, have been made by Dr. R. W. Chaney of the Carnegie Institution and by Miss Ethel I. Sanborn of the University of Oregon. These collections are now at the University of California, where a careful study of the plant impressions is being made by Dr. Chaney and Miss Sanborn, who is at present a graduate student at Stanford University. The plants from this bed indicate a warmer climate for this region than that of the other floras of this period on the Pacific Coast.

Since the 1924 issue of *Madroño* two members of the Society have passed away. One, Mr. Alfred L. Walker, was well known as a constant attendant on the field trips and as the Society's authority on drug plants. Gentle, kindly, courteous, he was much beloved. The other, A. J. Soares, also often joined the field trips. He was known to many members for his exquisite, colored photographs of the native flowering plants. Both of these members will be missed.

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September, 1928

MADROÑO

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Mr. David Goddard.
Membership Committee: Professor George J. Peirce, Stanford University.
Professor W. T. Horne, University of California.
Professor H. E. McMinn, Mills College.
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THE IMPROVED EASTERN BLUEBERRY IN CALIFORNIA

WM. T. HORNE

One of the notable achievements of a botanical-horticultural character in recent times is the successful introduction of the American blueberries into cultivation, and the improvement of these fruits by selection and breeding. As botanists know, credit for this two-fold accomplishment is due to Mr. F. V. Coville, botanist in the U. S. Department of Agriculture. A share should go also to Miss Elizabeth C. White of New Lisbon, New Jersey.

The blueberries of New England and the middle Atlantic states, both the high-bush blueberry, *Vaccinium corymbosum*, and the low-bush blueberry, *V. angustifolium*, have long been prized for their unique character and exquisite mildness. The plants grow in abundance in somewhat boggy places and in some of the open lands. When, however, cultivation was attempted, plants taken from the wild and set in home gardens regularly perished.

How the botanists were able to find out what was wrong with garden soils, so far as blueberries are concerned, is told in "Directions for blueberry culture," 1921 (1) and other papers to which the bulletin with the above title gives references. In brief, the ordinary enrichment of the soil with lime, wood ashes, and animal manures, changes its naturally acid condition to neutral or alkaline. This is favorable to most garden plants, but is fatal to blueberries. Strictly speaking, the blueberry itself is not directly injured; but it depends for prosperity on a certain fungous growth on its roots, and this fungous growth requires an acid soil. The presence of such fungi on the roots of various plants has long been known, and they have been called mycorrhizas. When the home garden was supplied with suitable acid soil, blueberries were found to thrive. If soils of suitable chemical qualities were chosen, it was also found that blueberries could be propagated and grown as a field crop like other bush fruits, and with promise of profit.

When the subject of cultivating blueberries was considered it immediately became apparent that the wild plants were extremely variable in size and quality of fruit and in productiveness. The story of how the plants producing the best fruits were discovered and tested is more delightful than a romance. Then, from the best plants thousands of seedlings were grown, and at last a few saved as promising for commercial planting.

For a long time I have been possessed of a growing curiosity to know whether the Eastern blueberries could be made to thrive in California, and especially I had coveted the improved varieties. From time to time I heard of this person or that who had tried them, but only to fail. In the winter of 1925-26 I selected a little spot in my garden where I thought they might possibly be given a fighting chance.

Through Mr. Coville I got in touch with the J. C. White nurseries, Whitesbog, New Jersey, and received from them the offer of a remarkably generous gift of plants for introducing in different parts of the state where they might be expected to succeed. Fearing the possible introduction of the Japanese beetle into California, I finally declined the larger offer, but I did receive, gratis, six sturdy little plants, one each of the varieties Adams, Grover, Harding, Pioneer, Rubel, and Sam. The plants were carefully examined by the County Horticultural Inspector, as well as by his chief, the County Horticultural Commissioner, and the Plant Quarantine Officer of the Port of San Francisco. In spite of all this attention, I was not convinced that some Japanese beetle larvae might not escape detection among the roots, which were densely matted and retained tenaciously the peat in which they had grown. Accordingly, the plants were potted and placed in large insect-proof cages, and all material from about their roots carefully sterilized. When the middle of August passed without the emergence of Japanese or other beetles, the plants were considered safe and were moved to the open. They made an apparently healthy but moderate growth. The limitation of the pots and the soil used probably accounted for the small growth. The soil available was a mixture of sand, sphagnum, and river peat. The last is not considered very favorable for blueberries.

Now came the most critical time of all. How would these strangers from a stern Atlantic climate take their winter rest and emerge into growth in the spring? The Eastern blueberries had been shown to be plants for which winter cold was necessary for normal growth (2). We used to say that cold was needed to cause various plants to take a proper rest, but now we are told that many plants enter the rest period during summer or autumn. The effect of cold weather is not to induce the rest but to break it, so they may grow off rapidly in the spring. Professor Chandler has an excellent discussion of this subject in his recent book, "Fruit Growing" (3).

One of the classic experiments on rest period in plants showed that blueberries in the greenhouse during the spring and summer grew normally, gradually ceased growing, and thereafter never renewed growth, though kept in the warm greenhouse until they died. One branch of such a plant which had ceased to grow was taken out through an opening and kept outside during freezing weather, but not detached from the plant, which remained in the greenhouse. In its normal season the exposed branch burst into new growth, but the part of the plant which had remained in the warm house failed to start. Not only blueberries but many other plants need the winter cold to grow properly in spring. Especially south of the Tehachapis, in California, peaches, walnuts, and many trees start growth very tardily in some springs, and lose the crop of the year, presumably because of a too mild winter (4).

With the approach of autumn, our blueberries were watched with an increasing interest. The formation of new shoots gradually ceased. Buds appeared in the leaf axils, but they were not of equal size and

apparent firmness. Autumn colors gradually spread over the leaves, but the coloring showed considerable variation in the six varieties. Some were decidedly high colored and would make an attractive show for a rather long time. Before midwinter all the plants were bare of leaves, as befits orderly deciduous shrubs.

The autumn of 1926 was probably not normal in Berkeley, for the deciduous magnolias blossomed in November and developed some leaves, instead of waiting until spring. Also camellias blossomed in the fall. The winter, 1926-27, however, should not be considered unusual as regards temperature. During December and January there were a number of mornings with white frost, but only very tender plants were injured. Callas frequently showed some wilting but always recovered during the day. During the late winter there were protracted heavy rains, and in early April there was a cold spell, following which most apricot and plum blossoms fell and a good many apricot and cherry trees died from the condition called sour sap.

Until midwinter, all the blueberries, in eight-inch pots plunged in the ground, were exposed between two of the greenhouses at the northwest part of the Berkeley campus. Then two of the plants were sent to a co-operator in Sonoma County. Three of them were set in

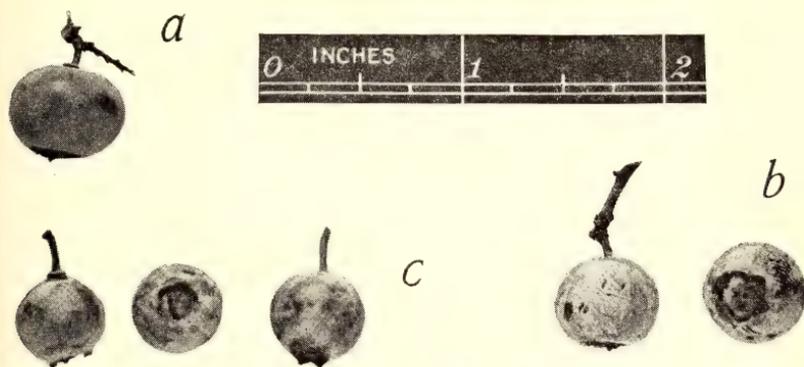


Fig. 1. BLUEBERRY fruits from the garden of W. T. Horne in Berkeley. *a*, Harding, June 29, 1927; *b*, Pioneer, June 15, 1927; *c*, Rubel, June 29, 1927. Most of the Rubel fruits came in generous clusters but they did not ripen uniformly in the clusters. Photograph by W. C. Mathew.

my own garden. The plant of Grover was left undisturbed in its eight-inch pot. It blossomed somewhat later than those in my garden and, though apparently normal in every way, the calyces remained green for a long time without ever swelling into fruits. This indicates the necessity of having more than one variety in a planting to secure cross fertilization. The bushes at my house started in an apparently normal manner and grew moderately. They blossomed sufficiently to indicate fruitfulness, and set well. No attempt was made to keep accurate phenological data, but flowering was rather long-continued, though practically finished by May 10. Fruit was about all ripe by

July 10, though a few small Rubels persisted to near the end of August. The largest single fruit was produced by the Harding, and the largest number and the largest clusters by the Rubel. The three plants, in three separate plots, have been growing in sand with a little sphagnum and, respectively, pine needles, acacia leaves, and oak leaf mold. There has been an occasional application of a few ounces of sulfur and sulfate of ammonia to the soil, which has received an occasional generous sprinkling, but has not been watered copiously or regularly.

From the foregoing it seems probable that the improved Eastern blueberries can be grown in the central and north coast districts of California. The essential conditions, adapted from Mr. Coville, are first, an acid soil (5), in which usually sand and upland peat are the most favorable constituents; second, an adequate supply of moisture; third, freedom from soil saturation during the growing season. It is not my idea that we are ready for the commercial exploitation of blueberries in California, but that these plants offer most alluring possibilities for those lovers of rare and exquisite fruits, who are not afraid to take pains and trouble, who are not thinking in terms of dollars, but who enjoy horticultural adventure. Very probably, however, blueberries will some day be grown for profit in some parts of California.

Certain suggestions arise. Perhaps our own native blueberry or huckleberry (6) is capable of improvement; it may be that some of its forms are sweet and smooth in flavor and texture and large in size; or perhaps it could be crossed with the Eastern forms and give new fruit of unexpected merit. Who can predict what may be found and even brought to being in the way of California blueberries? If any plant lovers should be attracted by the idea of growing blueberries, they would do well to seek the co-operation of the local horticultural commissioner or other plant quarantine official in connection with the bringing in of plants.

- (1). COVILLE, FREDERICK V. Directions for blueberry culture. Bulletin 974, U. S. Department of Agriculture, 1921.
- (2). COVILLE, FREDERICK V. The influence of cold in stimulating the growth of plants. Journ. Agr. Research. 20, pp. 151-160, pls. 20-35. 1920.
- (3). CHANDLER, W. H. Fruit Growing. Pp. i-xv and 1-777, 60 figures, 84 tables. Houghton Mifflin Co., 1925.
- (4). HORNE, W. T., GEO. P. WELDON, and E. B. BABCOCK. Resistance of Peach hybrids to an obscure disease in Southern California. Journ. of Heredity, Vol 18, pp. 99-104, figs. 5-8. March, 1926.
- (5). The degree of acidity said to be favorable for blueberries is expressed technically as $\text{PH}=5$. A neutral soil would be described as $\text{PH}=7$, and $\text{PH}=8$ or a higher number, would indicate an alkaline soil. Much of our soil in the north coast country is too acid for best results with farm crops and the use

of lime is rather general. By consulting the local Farm Adviser or the College of Agriculture, Berkeley, arrangements can probably be made to test the acidity of the soil in any particular locality.

- (6). PROFESSOR W. L. JEPSON, in his "Manual of the Flowering Plants of California," lists six species and two varieties of the genus *Vaccinium*, and it is interesting to note that the variety *saporosum* Jepson, set off from *V. ovatum* Pursh., is said to possess fruits of superior flavor. *V. ovatum*, the evergreen California huckleberry, is a valuable commercial ornamental green, and its fruit is collected and canned in at least one factory in northern California.

Division of Plant Pathology,
University of California,
November 15, 1927.

THE BOTANICAL EXPLORERS OF CALIFORNIA.—III.

WILLIS LINN JEPSON

George Hansen

The foothill region of the Sierra Nevada has always been, considering its importance in relation to plant distribution and to ecology, a neglected region from the botanical viewpoint. There have been on the whole few resident botanists in that area, and fewer still whose residence or interest lasted over a long period. For shorter periods, however, good work in exploration and in local studies has been done. In the early years of the nineties the settlers in the foothills of Calaveras County became familiar with the sight of a man who, on holidays and Sundays, went through the cañons and over the hillslopes, into the forests and river bottoms, gathering specimens of native flowers, trees and shrubs and bestowing them in a long tin box which he carried or frequently in a kind of wooden press bound by leather straps. This was George Hansen, a German. The foothill folk sometimes thought his interests in native things strange or eccentric, but he was well liked by all of them on account of his ever cheerful disposition and courteous demeanour.

George Hansen was born April 15, 1863 in Hildesheim in Hanover. He was the grandson of J. G. K. Oberdieck, sometimes called the Father of German Pomology. On account of his services to the state the Prussian Government granted to Herr Oberdieck a free college education to such of his grandsons as desired to work in horticulture. It fell out, in consequence, that the young Hansen, after completing the work of the gymnasium in his birthplace, was sent to Potsdam for the course in the Royal College of Pomology.

In 1885 he went to England and took employment with F. Sander & Company, working at first in the orchid house and later making

illustrations for "Reichenbachia". He left England in 1887 for San Francisco where he engaged in the nursery business with Hans Plath, one-time President of the California Floral Society.

In 1889 he was appointed foreman of the University of California Foothill Experiment Station at Jackson, Amador County, where he remained for about seven years. During this period he prepared

the greater portion of his book on the Orchid Hybrids, an enumeration and classification of all hybrids of orchids published up to 1897 (334 pages, 1895-1897), and drew the figures used in illustration of the second part of Greene's West American Oaks. This illustration work developed his field interest in the genus *Quercus* and a little later he called attention to many of the interesting and remarkable variants of the native species of oak which he discovered in the region of the Foothill Station. During his summer vacations he collected the native plants in Amador, Calaveras and Alpine counties of the Sierra Nevada with zeal and enthusiasm, and distributed to various of the leading herbaria of the world numbered sets of 1500 specimens containing material of some thirty new species and varieties as published



GEORGE HANSEN

by various botanists of his correspondence. Several novitiates in this collection were named for him, among them being *Sitanion Hanseni* J. G. Smith, *Poa Hanseni* Scribner, *Trifolium Hanseni* Greene, *Senecio Hanseni* Greene, *Solanum Hanseni* Greene, *Godetia Hanseni* Jepson, and *Cercospora Hanseni* Ellis & Everhardt.

A narrative of his botanical trips in the central Sierra region of Amador, Calaveras and Alpine counties was published by Mr. Hansen in a little pamphlet entitled *Flora of the Sequoia Region* (23 pp., 1895), being supplemented by a list of the plants collected and distributed in his *exsiccatae* (pp. 14). The more important stations at which he collected are as follows: Fisher's Cabin on the Mokelumne River; Clinton or Clinton Hills, 2000 feet in the foothills a little north of east of Jackson; Pine Grove, about five miles north of Clinton; Foothill Experiment Station near Jackson; New York Falls, 2000 feet; Antelope, near head of Tiger Creek, 4500 feet, on the road to Silver Lake from Jackson; Armstrong station, 5000 feet; Silver Lake, 8000 feet; Twin Lakes, 8500 feet; Carson Spur, 8500 feet.

Of his other writings there may be noted "Ceanothus in the Landscape of the Sierra Nevada" (Gard. & For. 10: 102,—1897); "Iris Hartwegii Baker" (Gard. & For. 10: 95,—1897); "The Lilies of the Sierra Nevada" (Erythea, 7:21-23,—1899); "The Reafforesting of the Sierra Nevada" (Sierra Club Bull. 3: 224-229,—1901); "The Hillside Farmer and the Forest" (Sierra Club Bull. 5: 33-43,—1904).

An injury to his spine compelled him to give up charge of the Foothill Station and he removed to Berkeley in 1896. Here he lived for twelve years, devoting himself mainly to his garden, beyond the limits of which in later years he was seldom able to go. He died March 31, 1908. A sympathetic appreciation of his character, written by his friend Charles Murdock, may be found in the Pacific Unitarian (16: 180). Gifted with a buoyant and courageous spirit he was enabled to bear suffering that would have crushed the average man, and he will be long remembered by his friends for his patience and cheerfulness under adversity.

Berkeley, March, 1919.

COLLECTING TRIPS OF EZRA BRAINERD IN CALIFORNIA

VIOLA BRAINERD BAIRD

Dr. Brainerd made two trips to California, the first in the summer of 1897, the second in the summer of 1915. Two of his daughters were then living in California and his first trip was made primarily to visit them and to join them at their summer camp at Strawberry on the Placerville road. While riding on the stage along the South Fork American River he caught sight of a sedge which looked strange and asked the driver to stop while he collected it. This sedge proved to be a new species and was named in his honor, *Carex Brainerdii*.¹

From Strawberry (Echo P. O.) tramps and excursions were made to many points of interest, such as Desolation Valley, Pyramid Peak and Echo Lake, Snowy Cascade and Snowy Falls (near Slippery Ford), Meisner's Ranch (a climb of about five miles from Strawberry), Meisner's Lake and Little Lake (both near Meisner's Ranch), Lovers Leap, Lake Audrain, "Mrs. Watson's" and "Watson's Meadow" at Strawberry. In this region he collected generally but was particularly interested in sedges. His collection of sedges proved to be one of great interest to Mr. K. K. Mackenzie, the *Carex* specialist, since his abundant material was chosen with his usual care and discrimination. Later in this summer he went to Sisson where he continued collecting in the Shasta region.

¹By K. K. Mackenzie (Bull. Torr. Club. 40:534,—1923). Specimens of four other species of *Carex* collected in California by Dr. Brainerd were used as the types for new species by Mr. Mackenzie. See *Erythea* 8:6.—W. L. JEPSON.

His second trip, in 1915, was spent with his daughters in a camp on the Truckee River. His chief interest at this time lay with the genus *Viola*. For some time he had been absorbed in unravelling this much confused group and its hybrids in the eastern and southern states. In California abundant material both in fruit and flowers was obtained of *Viola praemorsa*, *venosa*, *purpurea* var. *pinetorum*, *adunca*, *glabella*, *Macloskeyi* and *nephrophylla*. He made a special trip to Nevada City, which was the type station of *Viola sequoiensis*,² as described by Dr. Albert Kellogg, the early Californian botanist. He wished to find this violet and the so-called sequoias under which they grew. Although as late as the first of August he was able to find fresh flowers but no sequoias, as this region is too far north for *Sequoia gigantea* and too far inland for *Sequoia sempervirens*.

From Berkeley, a special trip was made to Fort Bragg and Noyo on the Mendocino coast where he found material of *Viola sarmentosa*, *adunca*, *ocellata* and by rare chance specimens of *Viola Langsdorfii*,³ a violet which had not been reported from California before. He had found in one summer all of the California violets but seven. His daughter, however, was able to send him this material, at a later date, before he began his work on the "Violets of North America". This was published in 1921 as Bulletin 224 of the Vermont Agricultural Experiment Station. It contains 164 pages with 66 plates in black and white and 25 colored ones.

Dr. Brainerd was born in St. Albans, Vermont, Dec. 17, 1844. For twenty-three years he was president of Middlebury College. He died Dec. 8, 1924.

Berkeley, November, 1927.

NOTES AND NEWS

There is a station for McNab Cypress (*Cupressus Macnabiana* Murr.) about one-half mile west of the junction of the Alcalde mine road with the McCormick road to Indian Spring, Nevada County. It also occurs in one locality between Nevada City and Grass Valley.—A. E. WIESLANDER, Nov., 1927.

The first volume of Dr. LeRoy Abram's *Flora of the Pacific Coast* was issued May 15, 1923. It is bound in cloth, contains 557 pages and 1299 figures. (Stanford University Press. \$9.00).

A *Manual of the Flowering Plants of California* by Dr. W. L. Jepson was published 1923 to 1925. It is bound in cloth, contains 1244 pages and 1023 illustrations. (Associated Students Store, University of California, Berkeley, California. \$7.50).

²Published by Dr. Albert Kellogg in the Proceedings of the California Academy of Sciences 2:185 (1863). *Viola lobata* Bentham (Pl. Hartw. 298,—1848) antedates it.—W. L. JEPSON.

³Mr. Milo S. Baker, who has studied the violets of western America for thirty years, refers this Mendocino coast plant to *Viola palustris* L.—W. L. JEPSON.

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ADDITIONS TO THE FLORA OF CALIFORNIA.

HERBERT L. MASON

With the increase of accessibility of many of the more remote parts of California, botanical exploration has been advancing rapidly. New things are constantly being found to offer encouragement to the collector and lend fascination to his travels. Following are two such plants recently found by the writer and apparently not reported elsewhere by botanists.

Lupinus peirsoni n.sp. Perennial, much branched from the base, stems 3-6 dm. high; herbage white-silky throughout; leaves long-petioled, leaflets 7, unequal, 2-5 cm. long, oblanceolate, rounded and somewhat mucronulate at the apex; inflorescence a strict spike on an elongated scape, spike 4-10 cm. long, the lowermost flowers whorled, the upper scattered; bracts deciduous, somewhat rufous-silky; pedicels short, stout; calyx 2-lipped, the lips entire or somewhat obscurely denticulate at the apex, 8 mm. long, campanulate; corolla yellow, the banner orbicular-ovate, notched at the apex, sides recurved, 12 mm. long, 9 mm. wide, claw short-triangular, with a deep median fold, only the apex reflexed about 45 degrees from the axis of the flowers; wings 11 mm. long, enclosing the keel; keel ciliate in the middle portion only or above; pistil with long silky pubescence; ovules 3-5.

In loose talus soil of Rock Creek Cañon at the lower edge of the Piñon pine belt, alt. 4250 feet, Los Angeles Co., California; H. L. Mason 3026, April 27, 1926, type.

Lupinus peirsoni is a very striking member of the genus with its many erect close spikes of yellow flowers standing out above a rounded mass of silvery white foliage. It grows in the loose talus soil formed by the weathering away of the dry hills on the desert side of the San Gabriel Mountains. Its roots are deeply buried, due to the constant and rapid accumulation of soil about the plant, and its crown is diversely branched many inches below the present soil level. It gives me great pleasure to dedicate this species to Mr. Frank Peirson of Pasadena, California, to whom I am indebted for many favors and many a pleasurable trip in Southern California.

DODECATHEON HENDERSONI var. *yosemitiana* n. var. Plant 10-20 cm. high growing in dense tufts; storage roots many, short-oblong, resembling rice grains, pink to red; crown short, often disc-like; herbage glabrous; leaves short-spatulate to narrowly oblanceolate, 3-5 cm. long, 2-15 mm. wide, narrowed to a membranous petiole about half the length of the blade, margin often a hyaline band; scape 1-8 flowered, glabrous throughout; corolla white, rarely rose-purple, 5-merous; androecium deep purple, the filaments united into a narrow tube, anthers equaling or subequaling the filament tube; capsule exceeding the calyx, operculately dehiscent.

Headwaters of Yosemite Creek near Porcupine flat, Tioga Road, alt. 8000 feet, July 24, 1922; H. L. Mason 322, type. "Kings River

country, one-half mile beyond J. O. Pass, alt. 9000 feet, July 12, 1922, C. Flinn". Kaiser Peak, 10,000 feet, A. L. Grant 1011.

Dodecatheon hendersoni and its varieties usually occur in the foothills of the Sierra Nevada and in the Coast Ranges in the upper Sonoran zone and the lower part of the Transition zone. Altitudinally the group ranges to about 5000 feet where it is displaced by *D. jeffreyi*. It is therefore with some misgiving that I describe this plant from the Canadian and Hudsonian zones as a mere variety of *D. hendersoni*. The plant grows in dense tufts. It produces bulblets very abundantly and reproduces freely by them. Transplanting experiments on this variety have shown it to grow and bloom freely at higher altitudes, but it seems unable to cope with the hot dry conditions that prevail at lower altitudes. In these experiments, plants were taken from Porcupine Flat to Tuolumne Meadows and to Mather. The former locality is 8500 feet altitude and the latter 4700 feet.

THE BOTANICAL EXPLORERS OF CALIFORNIA.—IV.

WILLIS LINN JEPSON

George Dexter Butler

In the spring of 1880 the California stage coach, drawn by four horses, south-bound from Ashland, Oregon, carried one day as passengers, two botanists engaged in a botanical reconnaissance of the Pacific Coast with especial reference to the coniferae. One of these men was Dr. George Engelmann of St. Louis, the other Professor Charles Sargent of the Arnold Arboretum at Jamaica Plain in eastern Massachusetts. As the straining horses drew the coach heavily up the steep grade of the Siskiyou Mountains the two travelers conversed on the composition of the forest through which they were passing. Finally the summit was reached and when the trotting horses took the downward slope into Siskiyou County, Dr. Engelmann remarked: "I have written George Butler and I am sure he will meet us at Montague station; that is not far from Yreka." When they arrived at Montague there was no Mr. Butler. The two travelers continued their southward journey into the Great Valley of California.

At that time George D. Butler had been resident in Siskiyou County only a short time. He was born in Morris, Grundy County, Illinois, August 17th, 1850, though his early boyhood belongs to Bureau County. Later he attended the University of Iowa at Iowa City. He studied law, was admitted to the bar in Iowa, but did not begin to practice at once. After the fashion of many young lawyers he took up the teaching profession as a stepping stone to the law. He began to teach in Arkansas and in Indian Territory, developing during this period a botanical correspondence with Dr. George Engelmann of St. Louis, who received from his correspondent, amongst other things, a new *Isoetes*, which he named *Isoetes Butleri*.

Seized by the spirit of adventure Mr. Butler went west to California and followed various occupations such as teaching, running

sawmills and holding county office. In 1896 he was admitted to the bar in California and began the practice of law as his definite profession.

George Butler's passion for botany had always been such that he did not dare trust it. Therefore, on coming to California he determined to let the science of botany entirely alone. If he gave himself to it at all he feared that his proper profession as a lawyer would be largely or too much neglected and that his first obligation, the support and education of his family, would suffer. When the letter

came from his old friend, Dr. Engelmann, he was much puzzled in mind as to what he should do. If he went to the stage junction, there would surely be numerous fascinating field problems suggested to him and he felt doubtful of resisting such deep temptations. The letter, therefore, he deliberately ignored. In this manner the years passed by, practicing law in Yreka, the county seat of Siskiyou County.

In 1906 he chanced to be in a bookshop in Oakland where his eye caught sight of a second-hand copy of Jepson's Flora. For a few moments he hesitated and then laid the book down and went away. Still he found himself insistently pondering and considering. As a lawyer he had been successful; his children



GEORGE DEXTER BUTLER

had been educated and he was now financially independent. He went back to the shop, bought the book and determined to study and collect the native vegetation of Siskiyou County, an area over three-quarters that of the state of Massachusetts.

He threw himself into his new plans with fervent eagerness. He made collecting trips in every direction from Yreka, east to Goose-nest Mountain, north into the Siskiyou, west into the Marble Mountain region with all its varied vegetation, its engaging and interesting endemics. Meanwhile he built an herbarium building on his home property in Yreka, purchased floras and worked ardently on his collections. It was his purpose to found a county herbarium which should have a permanent character, a plan undoubtedly of economic value to the agricultural, horticultural and educational interests of the county, but a project which was, perhaps, a little in advance of the times. It was while engaged on these plans that he

was suddenly carried off by a stroke of apoplexy on October 3, 1910.

His herbarium, after his death, passed as a gift to the University of California. It is by far the most complete collection that has thus far been made of the flora of Siskiyou County. The specimens in it, or the duplicates distributed from it, are frequently cited by A. S. Hitchcock in his grass papers relating to California and by W. L. Jepson in the Flora of California, as well as by other writers. A number of his letters are in the Jepson Correspondence (vol. 6, ms).
Berkeley, November, 1920.

BIOLOGICAL PECULIARITIES OF CALIFORNIAN FLOWERING PLANTS.—I

WILLIS LINN JEPSON

Longitudinal fission in the plant body of *Ceanothus cuneatus* Nutt. (Buckbrush).

It was in August, 1890, while on a botanical expedition in the central Sierra Nevada foothills of California, that my attention was first attracted by the growth behavior of *Ceanothus cuneatus*. Shrubs

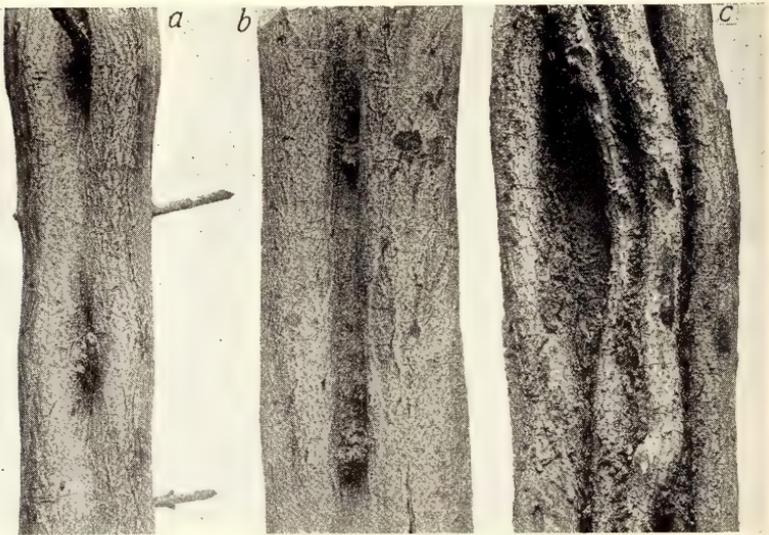


Fig. 1. *CEANOTHUS CUNEATUS* Nutt. *a*, stem 19 years old showing the bases of persisting dead branches and the well-formed lethal channels connecting them; *b*, stem about 30 years old; *c*, stem about 35 years old, showing the interlacing woody strands. Specimens from Kaweah, Sierra Nevada foothills. $\times\frac{1}{2}$.

of this species are often dominant in the chaparral on rocky or gravelly slopes, but also attain great development on little flats or vales in the hills where, in such situations, they may sometimes form the only woody vegetation. On these flats the stand is typically open, with grassy swales between the shrubs, the individuals characteristically forming a many-stemmed broad bush about six to ten feet high. The main stems from the base of a single shrub are often of very diverse age, but aside from age, study of the main stems showed that they were, as observed, of two wholly different developmental types as to origin, one type being the simple crown shoots, the other type representing sets of three or four stems, organically quite distinct, but each set of which had been derived by longitudinal fission from a single original crown shoot. The process of this development may be traced in this way.

The leaves of *Ceanothus cuneatus* are decussately opposite and bear in their axils decussately opposite branches. On the primary erect shoots this arrangement is fairly regular. The branches are small, uniform and more or less horizontally spreading; after four

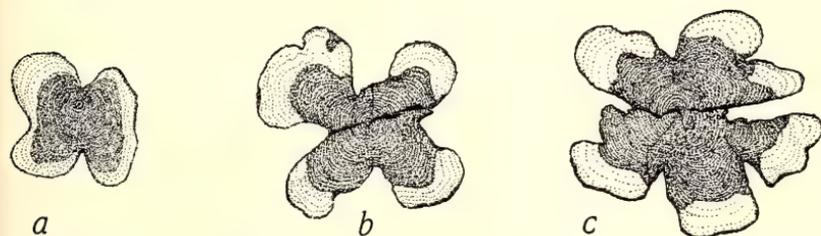


Fig. 2. *CEANOTHUS CUNEATUS* Nutt. Cross-sections of stems: *a*, stem about 19 years old, showing the irregularity in intrusion of the lethal channels; *c*, stem about 30 years old, the overlapping lethal channels having produced six woody strands which are connected only by dead heartwood (duramen); *b*, stem about 35 years old, the four living woody strands gradually separating from the duramen which is now being consumed by wood-destroying fungi. $\times\frac{1}{4}$.

to eight years, in great part, often almost wholly, they begin to die back and die completely. When the death of these tissues takes place there is initiated a depressant or lethal influence on the adjoining xylem tissues of the main stem both above and below the base of the branch, which influence extends vertically up and down the stem or trunk. The result of continued growth in the intervals is to develop roundish woody strands and thus to bring about a longitudinal channeling of the stem, which channeling connects with similar channeling which has formed contemporaneously at the next branch above or below (Fig. 1). Where there is no stem torsion, the stem, therefore, finally becomes deeply and regularly four-channeled longitudinally through the bases of the four rows of dead decussate branches; concurrently, as growth proceeds year after year, the stem develops four roundish ridges of wood which become more

deeply separated from each other (Fig. 1). After a period of fifteen to twenty years heartwood is formed which is without protection from wood-destroying fungi on account of the deeply intruding channels of dead tissues running lengthwise through the base of the small dead primary branches. When the heartwood decays completely three or four separate living trunks are thus formed from the single original shoot (Fig. 2).

Commonly there is more or less torsion of the shoot, with more or less displacement of the branches in the decussate arrangement. As a consequence the channels formed overlap and produce much irregularity or complexity in the development of the stem and of the separating longitudinal roundish strands (Fig. 1).

Usually it is only in quite old individuals that the full history of the stem proceeds as just described, but successive stages of the growth on the way to complete fission by decay of central dead tissues may be observed in the case of any individual that is mature or past maturity. In other portions of the range of the species—in the Coast Ranges and elsewhere—the initiation of the tendency to separation of the strands of woods is equally marked but is likely to be only partial in development.

Berkeley, Sept. 5, 1921.

CALIFORNIA PARK COMMISSION

The last legislature of California (1927) passed a bill authorizing a Park Commission; the bill was approved by Governor Young and is now law. The Governor has recently appointed the members of the Commission, consisting of Mr. W. E. Colby, Sierra Club, San Francisco; President R. L. Wilbur, Stanford University; ex-senator W. F. Chandler, Fresno; Judge Henry O'Melveny, Los Angeles; and Major F. R. Burnham, Los Angeles. The actual administration of all parks and monuments will be under the Division of Parks, State Department of Natural Resources, but will be guided by the policies as laid down by the Park Commission. All California state parks have an interest to botanists from the standpoint of conservation of wild life, or as sanctuaries for rare species. Any movement which has for its object the reservation of wild land in any part of the state should have the active support of members of our Society.—W. L. JEPSON.

NOTES AND NEWS.

A new periodical, entitled "Contributions from the Dudley Herbarium of Stanford University," is being issued under the direction of Dr. LeRoy Abrams. No. 1 contains "A Distributional Catalogue of the Lupines of Oregon" by Charles Piper Smith and No. 2, "Preliminary Report on the Flora of the Tres Marias Islands" by Roxana Ferris.

Dr. D. T. McDougal of the Carnegie Institution and Dr. Gilbert M. Smith of Stanford University have demonstrated living ray cells in the heart wood (duramen) of Redwood (*Sequoia sempervirens*) which were about a century old (*Science*, 66: 456). Dr. McDougal had previously shown the existence of living cells in Carnegia (*Cereus giganteus*) which continued to grow for a century (*American Naturalist*, 60: 393). These authors note that these long-lived cells are of the simple parenchyma type.

Dr. L. H. Knoche, well-known for his published work on the Mediterranean flora, has returned to California to live at his boyhood home, San Jose, where he has erected a fireproof building to house his botanical library of ten thousand volumes and an extensive herbarium which is especially rich in south European species.

The Nature Almanac or Handbook of Nature Education is an entirely new type of book by Arthur Newton Pack, President of the American Nature Association, and E. Lawrence Palmer, Professor of Rural Education, Cornell University. The book is a manual and directory combined. The status of nature study in each state is outlined; the activities of associations and clubs interested in nature study are described; a school outline of nature study is given at length; there is an extensive bibliography. These are a few of the excellent features. It may be thought remarkable that such a book has not been written hitherto. (American Nature Association, Washington, D. C.)

The Carnegie Institution of Washington has decided to centralize its botanical work in the west to the extent of erecting a headquarters building at some favorable location. This plan, to be carried out gradually, will affect plant physiology, plant ecology and systematic botany. It seems likely that a site may be chosen at Stanford University.

The genus *Orthocarpus* is most strongly developed in California where its individuals are so numerous as to be an important factor in the flowering coloration which is developed in the springtime on the open slopes of the foothills. The genus has been revised by David D. Keck who recognizes 25 species, all of them West-American except *Orthocarpus laciniatus* of the Andes of Chili and Peru. Specimens of the West American *Orthocarpus attenuatus* have also been collected in Chili, but may, the author thinks, represent possible introductions. (*Proc. Cal. Acad. Sci. ser. 4, 16: 517-571, —1927*).

M. Georges Poirault, Director of the Villa Thuret, a botanic garden in southeastern France, visited California in April, 1927.

Another recently issued textbook is "The Physiology of Plants" by George J. Peirce, Professor of Botany in Stanford University. The sub-title reads: "The Principles of Food Production". It is a readable and stimulating text with the exercise of much candor on disputed questions, of which there are quite as many in this department of the science as any other. (Henry Holt & Co., New York).

The Field Museum of Natural History (Chicago) has published a Flora of Santa Catalina Island (Bot. Ser. vol. 5, pp. 1-413, pls. 1-14,—1923). The authors are C. F. Millspaugh and L. W. Nuttall. It is a considerable output in a short time by Dr. Millspaugh who visited California but once and then only for a few months. He had, however, the zealous aid of Mr. Nuttall whose field work on the island adds valuable facts to practically every page, especially in the way of citation of specimens, an excellent feature but too often neglected by authors. Apparently it was made a principle to adopt every genus segregate possible and of course every species segregate. The work includes Cryptogams as well as Spermatophytes. It is a little odd, even in a linear sequence, to see Compositae succeeded by Polypodiaceae.—W. L. JEPSON.

A new edition of Holman and Robbins' Textbook of Botany was published in 1927. The authors are both of the University of California. As a general text it has come into very wide use by institutions of collegiate rank throughout the world. (John Wiley & Son, New York. \$4.00).

A MONOGRAPH OF THE GENUS MIMULUS.

The genus *Mimulus*, including the large number of monkey-flowers so familiar to the traveler everywhere in California, has been monographed by Dr. A. L. Grant. The monograph represents, obviously, a great amount of competent and painstaking labor. The descriptions are full without being prolix, localities and specimens are quoted at length, and the keys are carefully worked out, though in the key to the sections of the genus the expression "lower teeth of the mature capsule" is plainly impossible. One hundred and fourteen species, chiefly of the New World, are recognized. A considerable number of new species are published, not a few of them from California.

Under our varying conditions of soil, moisture, altitude and forest shade many *Mimulus* species in California are, in certain situations, prone to the development of exiguous states, in others to extreme dwarfing. Some of the new species listed in this monograph are, therefore, very likely edaphic variants of species already more or less familiar; one or two others seem to represent stages of juvenilism or maturity of species hitherto described. It is to be regretted that in this genus, which offers such unusual opportunity for instructive and significant drawings, the text could not have been illustrated quite fully. The "Monograph of the Genus *Mimulus*" can be purchased by addressing the Director of the Missouri Botanical Garden at St. Louis. (Annals of the Missouri Botanical Garden, vol. 9, pp. 99-384, plates 3 to 10,—1924).—W. L. JEPSON.

MADROÑO

JOURNAL OF THE
CALIFORNIA BOTANICAL
SOCIETY



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March, 1929

MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY

The purpose of this Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora; and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographical distribution of the native plants will be especially welcome.

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University of California
Berkeley

CALIFORNIA BOTANICAL SOCIETY

The purpose of the Society is to promote the botanical study and investigation of California plants, to diffuse knowledge concerning them, and by lectures, field-trips, exhibitions and publications to deepen interest in the native flora amongst the people of California.

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The Annual Dues are \$2.00 which should be remitted to the Treasurer, California Botanical Society, Botany Building, University Campus, Berkeley, California. Back numbers of the Journal may be had from the Corresponding Secretary, Botany Building, Berkeley, California. Subscription price \$3.00 per year.

WHY THE ESCHSCHOLTZIA?

EDWARD LEE GREENE

Doubtless our sunny plains, shady cañons and mountain forests yield types of floral beauty more delicate than the *Eschscholtzia* and some of them equally characteristic of California; why then should this poppy-like flower have been selected as the State's floral emblem?¹ The snow plant of the Sierra—stem, leaves, flowers and all of the richest crimson—is peculiar to California and the subject of universal and unbounded admiration. The lily family, an alliance of plants abounding in flowers of signal beauty and elegance, has plenty of distinctly Californian types not excelled by their relatives of other parts of the world. The lilies themselves, as they adorn our mountain woods and stream banks, might have furnished a State flower; or, even more appropriately, their near ally, the *Calochortus*, or butterfly tulip, or *Mariposa* lily, as it is popularly called. These, with our *Brodiaeas* and other lily-like flowers, are coveted throughout the world by flower growers as among the most surpassingly beautiful of all the plants indigenous to California. Even the blue and white and purple-flecked *Nemophilas*, or their kindred, the *Phacelias*, whose masses of bloom impart to our wheat fields in March the hues of the sky overhead, might have furnished a good floral emblem.

But the State flower must be that of a plant more generally disseminated throughout our commonwealth, more conspicuous—in a word, more popular than any of these. The *Sarcodes*, or snow plant, gorgeously beautiful though it be, is limited to the woods of the upper Sierras, where in its native vigor and freshness, perhaps not more than one in a thousand among us will ever behold it. And it steadily refuses to be cultivated; moreover, it is after all only a splendid parasite, and California is not a parasite State. The delicate yet brilliant *Mariposas* put forth their white, or red or yellow pendants in the shade of thickets, or among the more inaccessible places of the mountains. They are matchless among our wild flowers, in both form and coloring, but they are too select and retiring for popularity. The grain field flowers of spring, painting whole landscapes, are both short lived and local. They are of the great interior valleys but not of the whole State.

All the prerequisites of an acceptable floral emblem for California meet in the *Eschscholtzia*. It is a plant of singular beauty. The delicately-cut foliage, the graceful stem, the satin-like luster of the golden petals—all these combine to make such a plant as flower lovers in all parts of the world have prized highly ever since the

¹This article was written to serve as part of the general observance which took place in 1890 on the occasion of the adoption of the *Eschscholtzia* as the state flower of California by vote of the California Floral Society and other public organizations. By act of the legislature of California in 1903 the *Eschscholtzia* became officially the state flower of California. So far as we know this article has never been printed in any magazine of botany or horticulture.—W. L. J. MADROÑO, vol. 1, pp. 195-202, Apr. 22, 1929.

time of its first discovery. It is distinctively Californian. There is no *Eschscholtzia* indigenous to any island of the sea or any continent but North America; and even here it is confined to the Pacific Coast, where it is well-nigh exclusively Californian. While a single species illuminates the plains of northern Mexico in early spring, and another extends northward to the valley of the Columbia, all the rest are strictly Californian. And within the State they are of more universal distribution than almost any other of our native flowers. The great desert of the Rio Colorado has its peculiar *Eschscholtzia*, and that quite different physical region, the Mojave, has two species, one of them with flowers so small that none but a botanist would be likely to recognize it at first glance as of this genus. Another sort adorns the San Diego seaboard hills; and still another—and this is the original *Eschscholtzia Californica*—enlivens our northern coasts from Monterey to San Francisco. Both the plains and the foothills of our great interior valleys present in many places in the month of April vast landscapes largely orange-colored by the profusion of the handsomest of all the species, *Eschscholtzia crocea*. Still another sort, a small and close-tufted plant with flowers of lighter yellow, occupies the hill country of our more northerly districts; and this species drew the attention of the mining pioneers of forty years ago, springing up as it did and unfolding its yellow flowers abundantly on every dump newly made by the pick and spade of the gold-seekers. And men pressed the brilliant corollas and sent them in letters home to the east and called them the “California Gold Flower”. It was a name most naturally suggested to their minds by both the habitat and the hue of the petals which might well have been retained as a popular one for these plants. It was at a later period, and only by help of the botanists, who knew the plant to be of the poppy family, that the name of California poppy came into use. It is not a very good name, inasmuch as it is hardly a natural one. The affinities of the *Eschscholtzia* are with the poppies, no doubt; but the external resemblance is so slight that none but a professional botanist would have been likely to detect the relationship.

As a popular name *Eschscholtzia* will, perhaps, always continue to be objectionable; a college course in German seeming to be almost necessary to either an understanding or a correct pronunciation of it. But this, like every other scientific plant-name, has a history; and, to those who know the history, a fitness. A brief sketch of the origin of this name *Eschscholtzia* may, perchance, commend it to the scorner of Teutonian polysyllabics in general.

Seventy-five years ago our State floral emblem had neither a name nor place in the lists of either botanists or florists. Two years since at the German capital they unveiled to the public a statue of an eminent traveler, botanist and man of letters, Adelbert von Chamisso; and it was he who had the happiness of discovering in California, and of introducing into Europe, this most characteristic of our California plants. In the year 1816 this man, then a youth, in company with his intimate friend, John Frederic Eschscholtz, during

successive October days rambled over what must have been bleak and desolate hills where now stands the city of San Francisco. They were both fresh from university halls, and, as young men of promise, had received appointments from the Russian Emperor to accompany Lieutenant Kotzebue on his voyage of discovery. Eschscholtz was surgeon and zoologist to the expedition, Chamisso was botanist, and upon their return from the voyage, Chamisso made known to the botanical and floricultural world the most beautiful of their new acquisitions, the California poppy-like flower, dedicating it to his friend and companion of the voyage, the young Dr. Eschscholtz.

Berkeley, Dec. 3, 1890.

HISTORICAL NOTE ON THE MONTEREY CYPRESS AT CYPRESS POINT

HARRY ASHLAND GREENE

In the Cypress Grove, at Cypress Point, Monterey, there are 10,550 cypress trees, including those growing along the "Seventeen Mile Drive" strip between the main grove and Pebble Beach, which property is being sold for residence purposes. Leaving out the strip mentioned, the grove occupies about 50 acres. To arrive at the number of trees I divided the territory into seven sections, counting each separately. There are 2700 cypresses fringing the shore eastward from the main grove, in the strip referred to, thus leaving 7,850 trees in the 50 acres, other than saplings. Throughout the territory are surveyors' stakes and a new road has been built eastward through the grove. At a point where the cypresses terminate somewhat abruptly some clearing has been done. Many years ago I urged that the pines be cleared away there and back into the grove. It is now evident that, had this been done, there would be many more cypress trees in that area than there are now. Our short-lived tolerant pines have not only choked out the young cypresses but the mature ones have destroyed many cypress trees in falling, even large ones.

I have a personal acquaintance with all the cypress trees in the grove having any right to claim distinction. Some of them I have known for nearly forty years, particularly one which I named Octopus. I am willing to believe that this most distorted of all trees on earth is 1,000 years old, and that there are older ones in the grove. A tree sawn off at the ground many years ago is still lying sound and looks as if it might have lived 10,000 years; on counting its rings only 184 were found.

I wanted to believe that there are cypresses in our grove at least as old as the Christian Era, but my conscience forced me to join the ranks of the conservatives. Of course such persons are quite unpopular in this region and the tourist is regularly furnished with one or the other most wonderful stories of how and when the grove was planted by man. The age of the oldest trees is given to travelers as from four to eight thousand years.

A number of the old trees, back among the pines, have been hollowed by fire. One hollowed tree is about 70 feet high and measures

18 feet, 8 inches in circumference breast high. It is still in fair condition. Another cypress, growing about 1,000 feet from the ocean shore and which shows no mark of fire, has a girth, breast high, 15 feet, 4 inches with a spread of 90 feet in one direction and 75 feet in the other. At the ground, including the roots, the tape measure showed 34 feet as its circumference.

When we were trying to have the Cypress Point grove made into a National Monument its land value was deemed insignificant; at the present time villa sites, with shore frontage, are held at ten thousand dollars per acre.

Monterey, November 16, 1921.

PHYSIOLOGICAL BILABIATION AND PHYSIOLOGICAL IRREGULARITY IN THE FLOWERS OF CALIFORNIAN ANGIOSPERMS.—I

WILLIS LINN JEPSON

In laying down principles of classification and phylogeny in the field of the Angiosperms it is taken as an axiom that regular (actinomorphic) corollas are to be regarded as representing a more primitive state than irregular (zygomorphic) corollas. Such an axiom may be defended, in part, on the grounds of the general morphology of the flower in connection with the morphology of the angiospermic plant as a whole. The cases of teratology in which highly irregular flowers become regular or sub-regular also bear on this matter. Reference may be made, as an example, to the highly zygomorphic type of flower in *Scrophularia californica* Cham., which, at times, as an abnormal condition, becomes sub-regular.¹ Numerous other instances in the field of teratology might be given.

A long series of families of flowering plants as represented in California are characterized by regular corollas. In many of these families, more or less widely scattered phylogenetically, there is shown an evident tendency to exhibit species with irregular flowers, or even occasionally genera. The irregularity that is here under discussion is limited to what may be called physiological irregularity, that is those cases in which the parts of the corolla remain morphologically of the same size and shape, but the parts are so disposed as to form a flower that is in structure constantly irregular or zygomorphic. It has been my practice in the field to speak of this peculiarity as *physiological irregularity* or, in some cases, as *physiological bilabiation*. It is now proposed to describe and discuss various species which illustrate this condition.

Clarkia pulchella Dougl. is a not uncommon plant on openly wooded slopes in the foothills of California, usually growing in a soil where there is at least some surface woodland mulch. Long ago I had noted and described the four petals as spreading in pairs

¹ Cf. Jepson, *Erythea*, 7:123-127, fig. 3 (1899).

right and left so as to make a flower which is markedly zygomorphic from a physiological standpoint.² In this connection it is now necessary to describe the stamens which are eight in number, four long and four short. The long stamens bear crimson anthers which open only by a pore beneath the terminal appendage. The four short stamens have white anthers that open their full length. Each and every filament has a tuft of hairs at the throat, so that there appears to be a ring of hairs at the throat. Below this in the cup, there is another ring of hairs, very well defined, but not so dense. This species has been studied at numerous stations in the field but the following notes were made in a colony on the upper San Benito River at the mouth of Lorenzo Creek.

This colony grew under a Blue Oak (*Quercus douglasii* H. & A.) tree where the steep slope was covered with leaf mold. The records were made in early June, 1927. Bees are now visiting the flowers. The bee alights on the protruding white style and the stamen cluster and hangs on by these organs. The petals, as said, spread right and left, and do not interfere with alighting on the flower from above or swinging the body freely downward. After establishing himself on the flower the bee feeds on the freely exposed pollen masses of the short white anthers, his body, with its hairy under surface, resting on the long stamens and brushing up pollen from the long crimson anthers. These anthers have the pollen so disposed that the bee could not easily feed upon it; but this pollen is evidently carried by the under parts of the bee to another flower where it is thrust directly against the stigmas of the protruding style which stands directly in the way of the insect visitor.

It seems a natural inference that the physiological irregularity in *Clarkia pulchella*, which I have noted as a widely spread phenomenon, is to be associated with the biological needs of the flower in relation to insects.

Berkeley, September, 1927,

FIELD NOTES ON CERTAIN BRODIAEA SPECIES IN HUMBOLDT COUNTY

MILO S. BAKER

These notes concern my nos. 137 a, b and c, which is *Brodiaea congesta*, nos. 138 a, b and c, which is *B. venusta* and nos. 139 a, b and c, which is *B. ida-maia*, as observed by the writer in Humboldt County. These species are found growing within a few feet of each other, at the head of the South Fork of Yager Creek, just inside the fence on the west side of the road, a few hundred feet from the east gate of the Lamb ranch. The date is July 28, 1923.

Brodiaea ida-maia is very common through this region and far to the northward; *B. venusta* is quite uncommon and occurs, so far as I observe, only where *B. ida-maia* and *B. congesta* are near at hand. I find *B. venusta* at one particular spot where no *B. congesta*

² *Flora of Western Middle California*, 332 (1901), ed. 2, 277 (1911); *Man.* 673, fig. 660 (1925).

can be seen; this station is in the low ground along the creek where *B. congesta* is naturally to be expected, but where cattle had been pastured, and where (being late in the season) it might easily have been destroyed. *B. ida-maia* is found everywhere in this vicinity, not only in the low ground, but on the slopes of the hills on both sides of the creek valley and pretty well up towards the top; but *B. venusta* is only found in the richer ground along the creek and here only am I able to find *B. congesta*. Both *B. congesta* and *B. venusta* appear to be earlier than *B. ida-maia*.

Brodiaea venusta appears to me to be a hybrid, not merely because its grows only (in this locality) where the other species are found, but from a comparison of its morphological characters with those of *B. congesta* and *B. ida-maia*. This idea is, of course, tentative and could be discredited by finding it occurring in some locality where one or both of the others are not found. The seeds of *B. venusta* should be collected and grown.

Brodiaea stellaris is quite abundant at one place on the south side of Yager Creek. This spot has a northeastern exposure. I do not see it anywhere else. Mr. Joseph Tracy has, however, collected it a short distance east on the north side of the creek. The spot where it is plentiful (my station) is not more than 20 or 30 feet across, in a shaded situation and moist, clayey soil. I find these plants to differ in minor particulars from the formal description of *B. stellaris* as follows: (a) length of scape 6 to 12 in.; (b) corm spherical; (c) wings purple and as long as anthers (though not as high), strictly approximate, curved under at top, thus partly concealing stamens and stigma; (d) perianth segments not narrow.

Santa Rosa Junior College, 1923.

VARIATION IN THE PAPPUS OF *LAYIA PENTACHAETA* GRAY

WILLIS LINN JEPSON

The collection, which formed the basis of *Layia pentachaeta* was collected by Dr. J. M. Bigelow in May, 1854, at Knights Ferry on the Stanislaus River, Stanislaus County. The species was published by Asa Gray in the Pacific Railroad Report, volume 4, page 108, in 1857. There is an excellent plate (plate 16). The type is in the Gray Herbarium, and has been examined through the courtesy of the Curator, Dr. B. L. Robinson. Of the flowers belonging to the type which were examined, some fifteen, all showed five naked pappus bristles. On general morphologic and phylogenetic grounds one may consider five to be the ancestral number in this form. Variations from this number are indicated by the following specimens: (1) Simpson Ranch, Sweetwater Creek, Eldorado County, K. Brandegee; pappus bristles one to five, naked at base; in one head the variation was one, two, three, four. (2) Simpson Ranch, Sweetwater Creek, K. Brandegee, pappus bristles nearly always none; two flowers were found in separate heads, each having one naked awn about half as long as corolla. (3) Simpson Ranch, Sweetwater Creek, K. Brande-

gee, pappus bristles usually none; in one head a flower was found with one bristle half as long as corolla and another flower with one bristle about one-fifth as long as corolla. (4) Roseville, T. Brandegee, pappus uniformly none. (5) Forest Hill, Placer County, H. N. Bolander 4579, pappus none in one individual, pappus bristles two or three in other individuals. (6) Fresno County, C. C. Parry 141, pappus none. While so very diverse in pappus character, these various specimens and others of the same general character aggregate naturally as the specific unit, *Layia pentachaeta*, which in this, its typical form, ranges from Placer County to Fresno County between 500 and 3000 feet. The peculiarity of the rather extreme variations in the pappus characters (each of which is very sharp and definite) suggests the influence of spontaneous crossing. The species flowers in April and May.

Another form likewise inhabits the Sierra Nevada foothills, often growing in the same localities as the form which integrates the botanical type. This second form bears flowers which exhibit 10 to 18 pappus bristles, but aside from pappus, the plants in every other respect, in habit, aspect, pubescence and size, appear to be quite conspecific with the plants of the five-bristled form. It is desirable to define this form by name and it is here called var. *HANSENI* Jepson n. var. (type Fisher's Cabin, Mokelumne River, Amador Co. foothills, Geo. Hansen 411). This state differs from the botanical type of the species, not merely in number of bristles but also in bearing on the crown (between the bristles) a series of soft and delicate straight hairs, making a sort of basal tuft. It seems likely that this state is the more common of the two. It may well be the primitive state in this whole pentachaeta group, the five-bristled form having been derived from it by reduction. The following collections are noted: (1) Simpson Ranch, Sweetwater Creek, K. Brandegee, pappus bristles about 15. (2) Fisher's Cabin, Mokelumne River, Geo. Hansen 411, pappus bristles about 10 to 14. (3) Folsom, T. Brandegee, pappus bristles about 11 or 12. (4) Merced foothills, Buckminster, pappus bristles about 10; one flower was found that had the 10 bristles common to the other flowers on the plant but was destitute of the short soft hairs.

NOTES AND NEWS

Commercial exploitation of rare indigenous species of flowering plants takes on each year new and undesirable phases. In 1928 a large number of individuals of the California Pitcher Plant (*Darlingtonia californica* Torr.), uprooted from their native swamps in the mountains, were offered for sale by street peddlers in central California cities. During one week, in March, 1928, about one thousand such plants were sold in Stockton, according to Mr. J. A. Sanford, a long time member of this Society. The practice is all the more reprehensible in that practically no gardens furnish conditions under which *Darlingtonias* will thrive.—W. L. J.

Mr. S. B. Parish, well known for his work on the indigenous vegetation of Southern California and for many published papers thereon, died in Berkeley on June 5, 1928, in his ninety-first year.

At the annual meeting of the Society held on Thursday, January 24, 1929 in the Botany Building, Berkeley, the following officers were elected: President, Dr. W. L. Jepson; First Vice-President, Professor W. W. Mackie; Second Vice-President, Mr. H. L. Mason; Treasurer, Miss Elsie M. Zeile.

Dr. Joseph Burt Davy, one-time a member of the botanical staff at University of California, is now Lecturer in Forest Botany in the Imperial Forestry Institute, University of Oxford, England.

Miss Eileen W. Erlanson, Department of Botany, University of Michigan, who is working upon the chromosome number in the genus *Rosa*, visited California in October, 1928, in order to make collections of seed and to study the native species systematically in the field. In addition to the living collection at Ann Arbor there is to be formed a supplementary garden collection at Pasadena.

A mimeographed schedule of field trips, March to December, has been prepared by the field committee. For those members who take the field trips it is being sent on request. The chairman is Mr. M. S. Jussel, 473 45th St., Oakland.

Mr. Daniel Cleveland, attorney-at-law and an early day botanical collector in California, who was a correspondent of many systematic botanists, died in San Diego on January 3, 1929.

Mr. Carl Purdy was commissioned in 1928 by private interests to make a garden at Ahwahnee for the purpose of being used as a "plant refuge" for native species of the Yosemite region.

Dr. Francis E. Long of the Desert Laboratory announces (*Sci.* 69:218) studies of *Cereus giganteus* which show stomata with functional movement for a century.

"An Annotated Catalogue of the Vascular Plants of Benton County, Washington" has been published by Harold St. John and G. N. Jones in *Northwest Science* for 1928 (pp. 73 to 93).

The following systematic papers have more recently originated from the Department of Botany at Pomona College: *The Potentillas of Southern California*, by P. A. Munz and I. M. Johnston (*Bull. S. Cal. Acad. Sci.* 24: 5-25,—1925). *Lonicera and Symphoricarpos in Southern California*, by David D. Keck (*Bull. S. Cal. Acad. Sci.* 25: 1-7,—1926). *The Shrubby Malvastrums of Southern California*, by F. E. Estes (*Bull. S. Cal. Acad. Sci.* 24: 81-87,—1925). *A New Malvastrum, California*, by P. A. Munz (*Bull. S. Cal. Acad. Sci.* 24: 88,—1925). *Southern California Plant Notes—III*, by P. A. Munz (*Bull. S. Cal. Acad. Sci.* 24: 47-51,—1925). *Miscellaneous notes on plants of Southern California—IV*, by P. A. Munz and I. M. Johnston (*Bull. Torr. Club*, 52: 221-228,—1925).

MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY



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July, 1929

MADROÑO

JOURNAL OF THE CALIFORNIA BOTANICAL SOCIETY

The purpose of this Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora; and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographical distribution of the native plants will be especially welcome.

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Stanford University

JOHN THOMAS HOWELL,
University of California
Berkeley

CALIFORNIA BOTANICAL SOCIETY

The purpose of the Society is to promote the botanical study and investigation of California plants, to diffuse knowledge concerning them, and by lectures, field-trips, exhibitions and publications to deepen interest in the native flora amongst the people of California.

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The Annual Dues are \$2.00 which should be remitted to the Treasurer, California Botanical Society, Botany Building, University Campus, Berkeley, California. Back numbers of the Journal may be had from the Corresponding Secretary, Botany Building, Berkeley, California. Subscription price \$3.00 per year.

THE EDDY TREE BREEDING STATION

LLOYD AUSTIN

Director of the Station

With the growing interest in reforestation in nearly all parts of the United States, it is natural that some thought should be given to the possibilities in developing improved types of forest trees. The practice of using new and better strains of agricultural crops is now so well established that no one would think of planting the inferior wild forms that were the progenitors of the present highly developed types. Yet in the present-day reforestation activities, all of the seed that is used is of the wild unimproved forms that only partially fulfill the requirements.

Mr. James G. Eddy, a lumberman of Everett, Washington, was one of the first to recognize this need for breeding work with forest trees, and as a result he established the Eddy Tree Breeding Station in the spring of 1925. He felt that one of the principal drawbacks to the planting of forest trees is the comparatively slow rate at which



Fig. 1. General view of nursery of Eddy Tree Breeding Station, showing sprinkling lines over the open beds of two year old seedlings in the foreground, and the enclosed beds of one year old seedlings in the background. The three beds in the immediate foreground contain, from left to right, *Sequoia sempervirens*, *Pinus radiata*, and *Pinus ponderosa*. The tallest of the two year old *P. radiata* seedlings are just 3 feet high.

they normally develop. Hence one of the main objects of the work of the Station is the development of more rapid growing strains of trees that will reach the merchantable size in a shorter time and that will have wood of good quality.

The Ecological Environment of the Experimental Station

After a search over a large part of the Pacific Coast for a suitable location, the site finally selected is a tract of 65 acres of land located about three miles east of Placerville, California. Here was found a wonderful combination of favorable conditions. The Station is situated near the lower edge of the main Western Yellow Pine timber belt, in the central Sierras, at an elevation of about 2,700 feet. All timber species typical of the lower Sierra (including *Pinus ponderosa*, *Pinus lambertiana*, *Pseudotsuga taxifolia*, *Abies concolor*, and *Libocedrus decurrens*) are to be found on the Station grounds or nearby. It is in the center of a belt of the most rapid growing *Pinus ponderosa* to be found in California, or elsewhere, as far as is at present known. The Station is so located that the climate is comparatively mild, making it possible to grow many exotic species that will not stand severe climates. The average growing season at Placerville is unusually long for the timber belt, being 205 days according to a 25 year average of U. S. Weather Bureau data. This

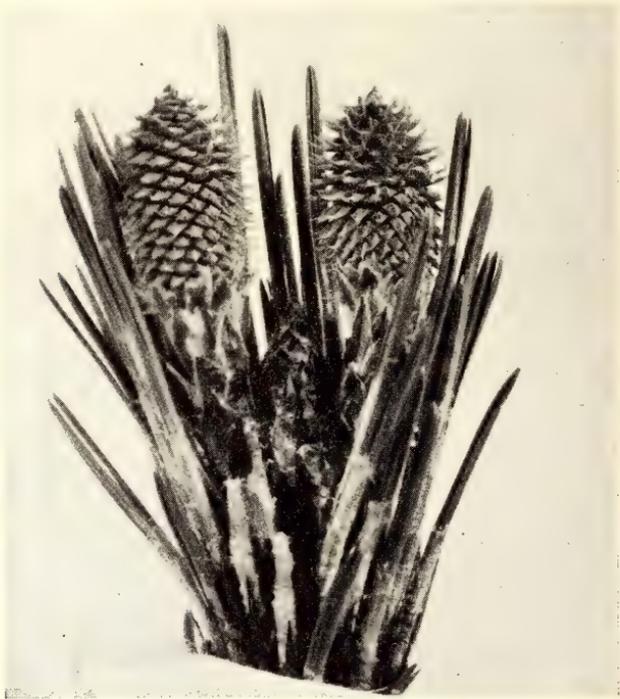


Fig. 2. Ovulate flowers of *Pinus ponderosa jeffreyi*. The photograph was taken several days after the flowers had been pollinated, and the scales have mostly closed together. The needles are just emerging from their sheaths.

gives a period of nearly seven months without killing frost, which is the same as the growing season in central Alabama. Of the other factors that were instrumental in reaching a decision as to the best location for the Station, the most important were soil, topography, and water supply. The Station soil is a deep loose sandy loam of a remarkably uniform character. An even and unbroken topography also contributes toward making conditions very much alike over the whole area.

The character "vigor" is a most difficult one to study from the point of view of heredity, for it is, to a greater extent than almost



Fig. 3. An exceptionally fine cluster of staminate catkins of *Pinus ponderosa jeffreyi*. Observations made in El Dorado County have shown that the color and shape of the catkins is one of the most reliable of field identification marks for distinguishing this variety from the species, when both are growing together. The catkins of *P. ponderosa* are bright red and quite long, while those of the variety *jeffreyi* are yellowish bronze and much shorter.

any other character, affected by varying environmental conditions. It is, therefore, of first importance, in nursery and arboretum experiments, to take every reasonable precaution to keep conditions over the whole area as uniform as possible. Figure 1 shows the experimental nursery area.

The field work of pollination and cone collection is largely in the hands of the Station Forester, Mr. John S. Barnes, while the

nursery and arboretum are under the supervision of the Propagator, Mr. H. M. Lumsden.

Phases of Work of Special Interest to Botanists

The writer feels that there are a number of phases of the experiments that should be of interest to botanists. In the first place, it should be pointed out that the work is being concentrated largely upon the different species of the genus *Pinus*, and a very thorough study of this genus will be made. An arboretum is being established which it is hoped will, in time, include a number of specimens of

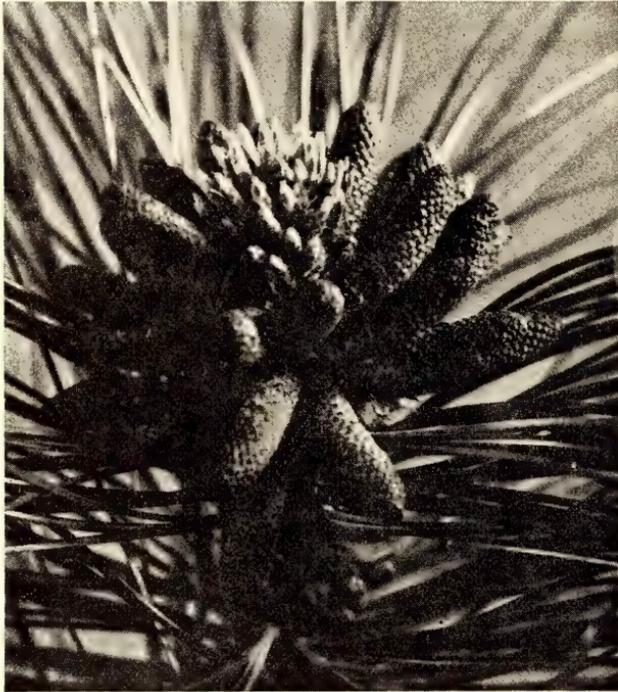


Fig. 4. The long slender staminate catkins of *Pinus ponderosa*. Compare with Fig. 3.

all known species of pines. The genus is a large and interesting one, and some difficulty is being experienced in obtaining seed of certain little-known species, particularly the rarer ones native to Mexico, the West Indies, India, and the East Indies. However, the writer has been corresponding with over 100 different organizations in many parts of the world, and already seed has been secured of the 32 different species and varieties marked with an asterisk in the following list, containing 118 species and fairly important varieties. The arrangement is based upon G. R. Shaw's relationship classification of the genus (1), but modified to give emphasis to the economically important species, by classing together several groups of minor ones. Group *Australes* is given first as it contains more valuable species than any other.

SECTION DIPLOXYLON

SUBSECTION PINASTER

Group Australes

- Pinus* apachea—Apache Pine.
 * " caribaea—Slash Pine.
 " cubensis.
 * " echinata—Shortleaf Pine.
 " glabra—Spruce Pine.
 " lawsoni—Lawson Pine.
 * " montezumae—R o u g h-
 branched Mexican Pine.
 * " montezumae hartwegi.
 " " lindleyi.
 " " rudis.
 " occidentalis.
 * " palustris—Longleaf Pine.
 * " ponderosa — Western Yel-
 low Pine.
 " ponderosa arizonica — Ari-
 zona Pine.
 " ponderosa benthamiana —
 Willamette Foothills Pine.
 " ponderosa deflexa.
 * " " jeffreyi—Jeffrey
 Pine.
 " ponderosa macrophylla—
 Large-leaved W. Yellow
 Pine.
 " ponderosa malleti
 " " mayriana—Mayr
 Pine.
 " ponderosa pendula—Weep-
 ing W. Yellow Pine.
 * " ponderosa scopulorum—
 Rocky Mt. Western Yellow
 Pine.
 " pseudo-strobus—False Wey-
 mouth Pine.
 " pseudo-strobus tenuifolia.
 * " sondereggeri—Sonderegger
 Pine.
 * " taeda—Loblolly Pine.
 * " teocote — Twisted-leaved
 Pine.

Group Insignes

- * *Pinus* attenuata—Knobcone Pine.
 * " banksiana—Jack Pine.
 " clausa—Sand Pine.

- * *Pinus* contorta—Shore Pine.
 " greggi—Gregg Pine.
 * " halepensis—Aleppo Pine.
 * " " brutia.
 * " muricata—Bishop Pine.
 * " murrayana — Lodgepole
 Pine.
 * " oocarpa.
 * " patula — Spreading-leaved
 Pine.
 * " pinaster—Cluster Pine.
 * " " des landes.
 " " gigantea.
 * " " hamiltoni.
 " pithyusa.
 * " " stankewiczii.
 " pringlei—Pringle Pine.
 * " pungens—Table Mt. Pine.
 * " radiata—Monterey Pine.
 " " aurea — Golden-
 leaved Monterey Pine.
 * " radiata binata—Two-leaved
 Monterey Pine.
 * " rigida—Pitch Pine.
 * " serotina—Pond Pine.
 * " virginiana—Scrub Pine.
 Group Macrocarpae
 * *Pinus* coulteri—Coulter Pine.
 * " sabiniana—Digger Pine.
 * " torreyana—Torrey Pine.
 Group Lariciones
Pinus brevispica.
 * " densiflora — Japanese Red
 Pine.
 * " densiflora globosa — Jap-
 anese Globe Pine.
 * " densiflora umbraculifera—
 Japanese Umbrella Pine.
 " funebris.
 * " insularis—Khasia Pine.
 * " leucodermis — Graybark
 Pine.
 * " luchuensis—Luchu Pine.
 * " massoniana—Masson Pine.
 * " merkusi—Tenasserim Pine.
 * " montana—Swiss Mt. Pine.
 * " " mughus — Mugho
 Pine.
 " montana pumilio.

- * *Pinus montana uncinata.*
- * " *nigra*—Austrian Pine.
- * " " *calabrica* — Corsican Pine.
- * " " *cebennensis.*
- * " " *pallasiana.*
- * " " *taurica.*
- * " *resinosa*—Red Pine.
- * " *sinensis*—Chinese Pine.
- * " " *yunnanensis*—Yunnan Pine.
- * " *sinensis densata.*
- * " *sylvestris*—Scotch Pine.
- * " " *argentea.*
- * " " *lapponica.*
- * " " *rigensis* — Riga Scotch Pine.
- * " *sylvestris septentrionalis.*
- * " *taiwanensis.*
- * " *thunbergi*—Japanese Black Pine.
- * " *tropicalis.*

SUBSECTION PARAPINASTER

- * *Pinus canariensis*—Canary Pine.
- * " *leiophylla*—Mexican Yellow Pine.
- * " *leiophylla chihuahuana.*
- * " *longifolia*—Long-leaved Indian Pine.
- * " *lumboltzi* — Pino Barba Caida.
- * " *pinea*—Italian Stone Pine.
- * " " *fragilis.*

SECTION HAPLOXYLON

Group Strobi

- * *Pinus ayacahuite*—Mexican White Pine.
- * " *excelsa*—Himalayan Pine.
- * " *lambertiana*—Sugar Pine.
- * " *monticola*—Western White Pine.
- * " *parviflora*—Japanese White Pine.
- * " *parviflora pentaphylla.*
- * " *peuce*—Macedonian Pine.
- * " *strobis*—White Pine.
- * " *uyematsui.*

Soft Pines Other Than Strobi

- * *Pinus albicaulis* — Whitebark Pine.
- * " *aristata*—Bristlecone Pine.
- * " *armandi*—Armand Pine.
- * " *balfouriana*—Foxtail Pine.
- * " *bungeana*—Lace-bark Pine.
- * " *cembra*—Swiss Stone Pine.
- * " " *sibirica.*
- * " *cembroides*—Mexican Stone Pine.
- * " *edulis*—Nut Pine.
- * " *flexilis*—Limber Pine.
- * " *gerardiana*—Gerard Pine.
- * " *koraiensis*—Korean Pine.
- * " *monophylla* — Singleleaf Pine.
- * " *nelsoni*—Nelson Pine.
- * " *parryana*—Parry Pine.
- * " *pumila*—Dwarf Siberian Pine.

Cross Pollination

The groups following the first in the above list are given in order of their relationship to the group *Australes*, which gives an index to the ease with which crosses of different species can probably be effected. It is interesting to note that there are seven known natural pine hybrids (2, 3) and two species crosses that have been artificially produced, and that all but one are between pairs of species that are in the same relationship group. The list follows:

GROUP AUSTRALES

P. palustris (Longleaf Pine) x *P. taeda* (Loblolly Pine) = *P. sandereggeri*, H. H. Chapman, a natural hybrid occurring in Louisiana.

GROUP INSIGNES x GROUP AUSTRALES

P. rigida (Pitch Pine) x *P. echinata* (Shortleaf Pine). Reported by

G. S. Perry as a natural hybrid growing at Mont Alto, Pennsylvania.

GROUP INSIGNES

- P. murrayana* (Lodgepole Pine) x *P. banksiana* (Jack Pine). Reported by A. C. Holman as a natural hybrid occurring in northern Alberta, Canada.
- P. halepensis* (Aleppo Pine) x *P. pinaster* (Cluster Pine)=*P. halepensi-pinaster* Saporta, a natural hybrid.

GROUP LARICIONES

- P. nigra* (Austrian Pine) x *P. densiflora* (Japanese Red Pine). Hybrid produced by Dr. A. F. Blakeslee in 1914.
- P. sylvestris* (Scotch Pine) x *P. nigra* (Austrian Pine). Hybrid produced by Clotzsch in Germany in 1845.
- P. nigra* (Austrian Pine) x *P. sylvestris* (Scotch Pine)=*P. neilreichiana* Reich., a natural hybrid.
- P. montana* (Swiss Mt. Pine) x *P. sylvestris* (Scotch Pine)=*P. rhaetica* Bruegg., a natural hybrid.
- P. montana* (Swiss Mt. Pine) x *P. nigra* (Austrian Pine)=*P. Wettsteiniana* Fritsch., a natural hybrid.

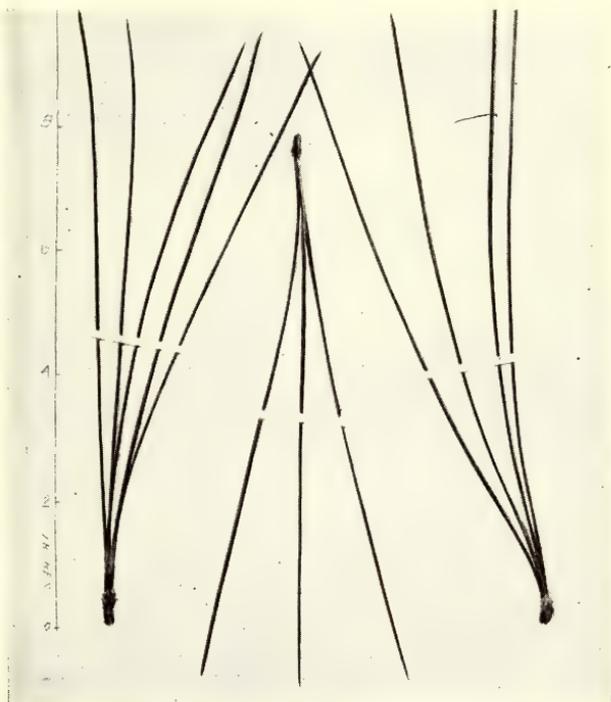


Fig. 5. Illustrating the variability of the needle number in *Pinus ponderosa*, a species which normally has 3-needled clusters. These needle clusters all came from one tree, a tree growing near Camino, California.

The fact that there is only one known cross between *groups* of hard pines, would lead one to believe that such crosses are much more difficult to make than those between species of the same group. However, the small amount of pine pollination which was done in the spring of 1926 has yielded 24 seeds of the cross *Pinus ponderosa* (Western Yellow Pine) x *Pinus montana* (Swiss Mountain Pine) and 29 seeds of the cross *P. ponderosa* x *P. sabiniana* (Digger Pine). Both of these are crosses of species in different groups, but groups which are fairly closely related. The hybrid seeds average nearly as heavy as normal well-filled seeds of *Pinus ponderosa* from this locality, and it is hoped that most of them will prove to be fertile.

The majority of the pollination work in 1927 was done using *Pinus ponderosa* as the female parent. A grand total of 7,648 flowers of this species were hand pollinated and smaller numbers were pollinated of *Pinus radiata*, *Pinus lambertiana*, *Pinus ponderosa jeffreyi*, *Pinus monticola*, *Pinus attenuata*, *Pinus murrayana*, and *Pinus sabiniana*. Pollen of 28 different species of pines were applied to the ovulate flowers of the Western Yellow Pine, in an effort to produce species crosses. In addition to the pollen collected by members of the staff, there was received in the spring of 1927, shipments from 42 different people which included 86 samples of pollen of 33 different species of pines. These shipments came from 23 states and from Canada, Mexico, Guatemala, and the Philippine Islands.

The crossing is being done with two principal objects in view: first, that of securing hybrid vigor, and second that of bringing together in a new hybrid form desirable qualities now occurring in two different species. Inbreeding, which is also being tried, is known to be quite successful in fixing most characters for which selections are commonly made. There may be some doubt, however, as to its effectiveness in the case of the character "vigor", in as much as inbreeding has the reputation of gradually causing a loss in vigor. This, however, does *not* always occur, and the only way to find out the actual effect in a particular case is to try it, as is being done. Giant as well as dwarf strains have been developed by this means.

Tests of Geographical Races

Although it is along this line that many of the European experimenters have worked, very little has been done to isolate geographic forms of species of pines other than those native to Europe. There is then, a wide field of opportunity in studying the relative hereditary characteristics which are transmitted through the seed of a certain species produced in different localities and on different sites. To date, experiments in this direction undertaken by the station have been confined principally to a study of the geographical races of *Pinus ponderosa*, altho the tests are being gradually enlarged to include other species, particularly the four important Southern Pines. In order to "kill two birds with one stone" an endeavor has been made to secure the seed from individual trees in each locality. In this way the tests will serve not only as "Geographical Race Tests"

but also as "Progeny Tests", to be described farther on. Already there are growing in the nursery Western Yellow Pine seedlings from separate trees in British Columbia, Nebraska, Arizona and California, and seed is expected in the fall of 1928 from individual trees of this species growing in Colorado, Oregon, Washington and Montana. As seed crops permit, the localities represented, and the number of trees in each locality will be materially enlarged.

Methods of Finding Superior Parent Trees

It would seem to be comparatively easy to go into a so-called even-aged stand and, by means of systematic measurements and increment borings, determine accurately just which trees of the stand are the largest *for their age*—that is, which ones of a certain age have the greatest cubic volume, as determined by their height, diameter and form. It was found after field trial that this method was hardly feasible for the reason that an increment boring will not give the *exact* age due to the difficulty in counting the rings near the center when the boring is taken at the ground line. When there is uncertainty in this matter it is very difficult to segregate the fastest growing individuals by field measurements.

Another method is being tried in an effort to locate trees in the forest that have the inherent capacity for unusually fast growth. The plan is to base the selection, not upon measurements of the trees themselves, *but upon the relative growth of their progenies in the nursery*. This fundamental principle is widely used by successful breeders of both plants and animals. It should bring to light *hereditary* differences, as these are the only ones that are passed on to the offspring through the seed. The progenies can be compared under the controlled uniform conditions of an experimental nursery; while the parent trees themselves can only be compared under the very diverse growing conditions of Nature in which no two trees have exactly the same surroundings, and in which it is most difficult to tell how much is due to variations in environment and how much to inherent tendencies. Also, this method makes it possible to compare a number of representatives rather than single individuals, and thus strike averages of performance and growing conditions.

The light cone crops of 1926 and 1927 have so far rather restricted this method, but the present plan calls for collecting seed in the fall of 1928 from about 800 individual trees of *Pinus ponderosa* scattered as widely as possible thruout the range of this species. Two plots one-half foot by four feet will be planted in the nursery of each progeny, and at the end of two years' growth, measurements and oven-dry weights of the seedlings will be taken to determine which 200 progenies out of the 800 have made the greatest development. Then seed of these 200, which was collected at the first collection, will again be planted, still allowing only two plots of each. At the end of another two years the number of progenies being saved will be reduced down to the best 60. Then enough seed of each of these will be gathered to plant five plots of each progeny, as the

experiment will by that time have reached the stage where it is practical to *prove* which two or three progenies are the best, by the use of a number of replications. This is hardly feasible in the early stages of the test, where hundreds of progenies are being compared.

Selection Among Nursery Seedlings

The methods last considered have dealt with ways of finding the most rapid growing individual trees in the forest. The present method is intended to bring to light the best individuals in a nursery. Due to the willing cooperation on the part of the majority of the large reforestation nurseries of the country, it has been possible to make selections for vigor among tremendous numbers of trees. In many of the nurseries visited the largest seedlings were picked from among hundreds of thousands of seedlings of a species, and in some cases, the number ran into the millions. It would seem that the relative chances of finding superior individuals is much greater by this method than the other methods that have been discussed, since any one year's work in selecting trees in the forest is likely to have to be limited to a consideration of hundreds, or at most thousands of individuals.

Nursery selection is, for the most part, carried on in seed beds where the seed has come from many trees and there is no record of parentage. Hence it is what the geneticist would call "mass selection." In a naturally *self-fertilized* species, the selection would be directed toward the segregation of the "population" into various pure lines, each having a different rate of growth, and each capable of reproducing itself true to type from seed if pollinated only by individuals of that line. But in naturally *cross-fertilized* plants, such as pines and walnuts, pure lines probably do not exist in the strict sense of the term, as the continual crossing does not allow for their development. In such plants, then, selection can, in the main, only be relied upon to locate individuals whose genetic constitution is heterozygous, but which, if raised to seed bearing age and self-pollinated, might be expected to yield a group of individuals which would exhibit some variation, yet would in general retain the vigor of the mother tree. However, when the selection is made among such large numbers there would also seem to be a fairly good chance of discovering occasionally vigorous mutations, which should come true from seed.

The writer would like to extend to all those who are interested in the work a cordial invitation to visit the experimental Station at Placerville and see the various tests that are under way in the nursery and arboretum. If a visit is not possible, the writer will appreciate hearing from those who are thinking along these lines, and he will welcome criticisms of statements or methods being employed.

Bibliography

1. GEORGE R. SHAW, "The Genus *Pinus*", Arnold Arboretum, 1914.
2. ASCHERSON & GRAEBNER, "Synopsis der Mitteleuropaishen Flora", Ed. 2, Vol. 1, 351-355 (1913).
3. H. H. CHAPMAN, "A New Hybrid Pine", Journal of Forestry 20: 729-734 (1924).

Placerville, Cal., Mar. 27, 1928.

THE SAMUEL B. PARISH BOTANICAL SOCIETY
AND THE RIVERSIDE BOTANICAL CLUB.

JOHN THOMAS HOWELL

On the evening of February 10, 1928, in the biological laboratory of the Riverside Junior College at Riverside, California, about twenty-five people from the interior counties of southern California, interested in the development of botanical study, met and formed the Samuel B. Parish Botanical Society. The expressed purpose of the society is "to advance the development of, and interest in, Botany, particularly taxonomic and floristic, to aid those interested in such study, and to work for the conservation and protection of our native flora." At the first meeting and the following one held in March, a constitution was drawn up and adopted. This provides for a meeting of the society to be held once each month except during the months of July, August, and September, the meetings being held alternately at Riverside and San Bernardino. Permanent officers have not yet been elected, the officers serving until an election is held are: Mr. J. B. Feudge, chairman, and Mr. M. French Gilman, secretary-treasurer. The program committee consists of these two officers and Mrs. W. D. LaNiece and Miss Mary Alice Smith. Membership is open to any one who is interested in botany and who wishes to join the society. On May 1, 1928 when the list of names of charter members closed, the society had an enrollment of forty-eight members, mostly from Riverside and San Bernardino Counties and from the eastern section of Los Angeles County centering at Pomona College, Claremont. There being no large cities in the district represented, the membership is somewhat scattered in small communities from Daggett to Elsinore and from Banning to Claremont. Meetings will be held both as field trips and indoor discussion groups. Before activities ceased at the beginning of summer three field excursions were held in the mountains about the San Bernardino Valley. The April meeting was an excursion to the burnt-over hills south of Devore Station, San Bernardino County, where the abundant spring annuals were observed. The May meeting was held at Rancho Santa Ana, in Santa Ana Cañon, Orange County, where a day was spent in studying the wild shrubs at the propagating plant of the rancho, and the spring flora on the nearby hillsides. The June meeting was held at Wrightwood, at 6200 feet elevation, on the desert slopes of the San Gabriel Mountains.

The Samuel B. Parish Botanical Society comes to fill a place in the botanical life of southern California left vacant by the cessation of activities of the Riverside Botanical Club and a short notice of that organization might not be amiss at this time. The Riverside Botanical Club was organized on July 22, 1903, by a group of people in the vicinity of Riverside who were interested in Botany. The first officers were: president, Mr. Stephen Grout, a botanist from Vermont, vice-president, Prof. E. A. Zumbro, secretary, Mr. Fred M. Reed. Mr. Reed continued in that position during the life of

the organization. On page 129 volume 3 of *Muhlenbergia* Mr. Reed writes: "This club has been working along with a small but steady membership, and has been successful in bringing the local botanists together for study and the mutual friendliness that springs up among people who are interested in the same lines of work and study. The meetings are largely informal, there are no financial obligations, no attempt is made to make the meetings 'popular' or 'entertaining' except to those actually interested. We meet on the Friday evening nearest the full moon for the benefit of members from out of town, from October to June of each year." Mr. S. B. Parish, well-remembered student of the southern California flora, whose memory is honored in the name of the new botanical society, was an honorary member of the organization. The Riverside Botanical Club continued as an active organization until the removal of most of the members from the vicinity of Riverside left too few to carry on the work. The last recorded meeting was held on Mar. 18, 1911. The principal remaining work of this club is a local check list of plants known to occur in the vicinity of Riverside, and, although it exists only in manuscript, this old list is still of very great convenience to local botanists.

The two organizations, the old and the new, have much in common in the spirit which brought them into being. It is interesting that the most striking changes in the nature of activities have not been brought about by developments in the science of Botany but by an external factor—automobile transportation. The automobile has made possible the variety of field trips which will be a prominent part of the activities of the present club and which were mostly lacking in the old days. Whereas in the time of the Riverside Botanical Club Mr. Parish could not be an active member of the club because his home was in San Bernardino, the present club has active members living as distant as Daggett, and Elsinore, and Banning. And now, meetings are not purposely held on moonlight nights to assist the nocturnal movements of the members!

Rancho Santa Ana, Orange Co., November, 1928.

THE BOTANICAL EXPLORERS OF CALIFORNIA—V.

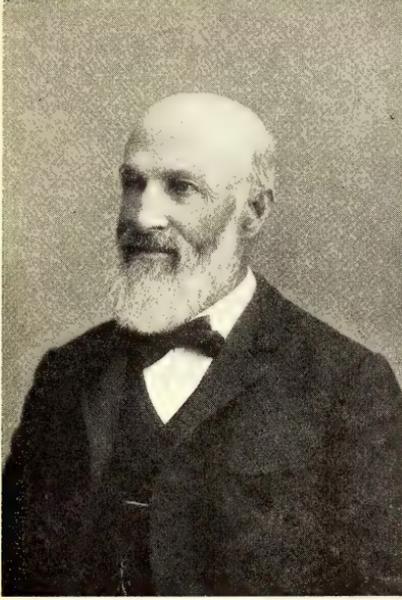
WILLIS LINN JEPSON

Charles Lewis Anderson.

There are some men whose inquiring minds incite them to rove over a wide field in all the natural history sciences rather than to concentrate mainly on one science or a special field in that science. All living things and the earth's surface itself stir them equally. Such a devotee of natural history was Dr. C. L. Anderson. His interests were widely scattered and he may, for this reason, be spoken of as the old-time type of naturalist whose love of outdoors led to an intimate field knowledge of birds, flowers, trees, rocks and streams.

He was born near Salem, Roanoke County, Virginia, September 22, 1827. The family removed to Indiana and the son attended Franklin College. After completing the course there he entered the

medical department of Asbury University, receiving the degree of Doctor of Medicine in 1852. After graduating he began practice in St. Anthony's Falls, now the city of Minneapolis. In 1862 he crossed the plains to Nevada and took up his residence in Carson City, after



CHARLES LEWIS ANDERSON

four years changing to Santa Cruz, California, where he lived the remainder of his life. While the practice of medicine was always his chief occupation, most of his leisure was devoted to outdoor recreation in botany, zoology and geology. The definite impulse towards natural history subjects came from early companionship with professors and students of Harvard and Yale Colleges on field trips. Dr. Anderson made local collections at his places of residence, those of more importance being at Carson City and Santa Cruz. His plant collections while at Carson City were rich in new species as may be seen from the paper by Asa Gray in the Proceedings of the American Academy of Arts and Sciences (6:519-556) entitled:

"New Plants of California and Nevada, chiefly from Professor W. H. Brewer and Dr. C. L. Anderson." *Trifolium Andersonii*, *Astragalus Andersonii*, *Prunus Andersonii*, *Erigeron Andersonii*, *Cnicus Andersonii*, *Aster Andersonii*, *Crepis Andersonii* and *Lycium Andersonii* were named in his honor by Asa Gray, while Dr. C. C. Parry named for him *Ceanothus Andersonii*, *Chorizanthe Andersonii* and *Arctosaphylos Andersonii*. Some of his plants were collected on a trip in southern Nevada from Carson, as, for example, *Lycium Andersonii*. *Ranunculus Andersonii* was collected at Blind Springs Mt., a locality placed by Dr. Gray "in the Eastern Sierra Nevada", but which is in eastern Mono Co.

Dr. Anderson's published papers are, so far as known to me, few and mainly botanical. In the year 1871 he published "A Catalogue of Nevada Flora" as a part (thirteen pages) of the Report of the State Mineralogist of Nevada. "The Natural History of Santa Cruz County" California (68 pages, imperial octavo), although not dated, was published in 1893; it is devoted to chapters on the local geology, marine algae, fishes of Monterey Bay, catalogues of the flowering plants and of the land and water birds of the county. During the period of his residence on the seashore at Santa Cruz, Dr. Anderson gave some time to the collection and field study of marine algae and

contributed to *Zoe* (2: 217-225) a "List of the California Marine Algae" and further notes (4: 358-362) on "Some New and Some Old Algae". His collections of algae were mainly determined by Professor W. G. Farlow, who named for his correspondent *Mesogloia Andersonii*, *Laminaria Andersonii* and other new species. The grasses and willows were also among his favorite plants (see his list of grasses in the Natural History of Santa Cruz County and a paper on "A Monoecious Willow" in *Zoe*, 1: 41). Doubtless he published various fugitive articles, such as that on "Redwood Stumps" (*Pac. Rur. Press*, 13:34, Jan. 20, 1877), and on the "Geological Outline of the Santa Cruz Range" (*Pac. Rur. Press*, 12:282, Oct. 28, 1876). His grass collection is now in the Dudley Herbarium of Stanford University.

Dr. Anderson was, however, not only a physician and a naturalist, but also a man of civic interests who gave freely of his services to the communities where he lived. As trustee he helped to build the first public school house in what is now the city of Minneapolis. He was School Superintendent of Ormsby County, Nevada, Surgeon-General upon the military staff of Governor Blaisdell of Nevada, School Trustee of Santa Cruz, California, for several years and a Trustee of the Santa Cruz Free City Library of which he is known as one of the two founders. An appreciation of his public services to Santa Cruz County and his character as a man is to be found in the Santa Cruz Surf for July 10, 1908. He died at Santa Cruz, December 22, 1910.

MEASUREMENTS OF CUPRESSUS PYGMAEA SARG. ON THE MENDOCINO "PINE BARRENS" OR "WHITE PLAINS".

WILLIAM C. MATHEWS

I found three groves of *Cupressus pygmaea* on the Mendocino coast where the trees grew unusually large, both in girth and in height. In each case the trees grew in low damp swales which during the winter months are covered with water for days at a time. On the outskirts of the swales the trees were smaller and not unusual in any way.

One place (situation no. 1) where *Cupressus pygmaea* attains a large size is one and one-half miles north-north-east of Fort Bragg and about one and one-fourth miles from the ocean. A second place is about one-half mile east of situation no. 1. A third place is back of Caspar and about two and one-half miles from the coast. The trees in this last locality are not so large in girth as in the former sections, but they are splendid tall trees, averaging perhaps 2 feet in diameter. In this locality they are found in the forest associated with Redwood, Douglas Fir, Tan Oak, Chinquapin and Sitka Spruce.

In the first two places the other species of trees had been cut down, leaving the Cypress standing, but on one forty-acre patch, the Cypress had been felled and sold to the Union Lumber Co. The Company sawed the logs and made lumber which was sold and manufactured into Cedar-wood boxes. Below are given the measurements

of a number of trees. These measurements are fair and accurate. Where a tree trunk was exceedingly large for a few feet only, I did not measure it. I took measurements only on well-developed or symmetrical trees.

Tree no. 1: trunk 100 in. in circumference at 30 in. from the ground; 84 in. in circumference 6 ft. from the ground. This latter circumference held good for 16 ft. and then tapered gradually to the top which was 100 ft. from the ground. The first branches were 30 ft. from the ground. This tree had been burned and the lower bark and some of the wood was gone. Cones were clinging to the dead top branches.

Tree no. 2: trunk 80 in. in circumference at 5 ft. from the ground, 80 ft. high.

Tree no. 3: a stump from which a log had been sold, $44\frac{1}{2}$ in. in diameter at 47 in. from the ground. I identified the stump by the bark and the remainder of the top which lay on the ground about 70 ft. from the stump.

Tree no. 4: trunk 115 in. in circumference at 5 ft. above the ground. The trunk was even larger in girth higher up. This was a beautiful tree, almost perfectly symmetrical. It had been burned and was dead; it was 100 ft. to the broken top.

Tree no. 5: trunk 80 in. in circumference at 5 ft. from the ground; a fine tree 80 ft. high, dead.

Tree no. 6: felled tree left on ground, the trunk 2 ft. in diameter, 85 ft. high, 40 ft. to first branches.

Tree no. 7: trunk 11 ft. 3 in. in circumference at 6 in. above the ground, held its size to 60 ft. and then diminished to a smaller diameter and grew 40 ft. higher. It had not been dead long because the top was literally loaded with branches and the branches in turn loaded with dried fruits.

Tree no. 8: trunk 14 ft. 9 in. in circumference at 6 ft. above the base, holding its diameter well to 50 ft. It was badly burned at the base, so had the tree been measured when intact it would have been considerably greater in circumference.

Tree no. 9: trunk 102 in. in circumference at 6 ft. from the ground; 90 ft. high. Its branches were self pruned to within 20 ft. of the top.

Tree no. 10: stump of a tree felled for the log, 37 in. in diameter at 3 ft. above the ground. A 60-foot log had been taken and the top was left lying on the ground. The diameter at 60 ft. was $19\frac{1}{2}$ in. The tree was 136 ft. high.

Tree no. 11: trunk 38 in. in diameter at 4 ft. from the ground. Measurement taken on a stump.

Tree no. 12: trunk 11 ft. in circumference, nearly 200 ft. high and holding its diameter exceedingly well towards the top.

The above trees were measured in situation no. 1, as given above. In situation no. 2, I measured the largest tree I ever saw of this species. This tree had a trunk 27 ft. in circumference at 5 ft. above the ground and was well over 150 ft. high. The tree was dead but

the bark was still clinging to the tree and the wood was sound. In this same locality, on about 40 acres, there were many trees of large size, all standing, but trees of other species were nearly all cut down, leaving almost a pure forest of the Cypress. Hundreds and thousands of Cypress seedlings were springing up all over the place and especially about the base of the trees. I noticed where a tree had fallen that a large semicircle of seedlings grew about the crown for quite a distance around but not near the center of the tree. This is due to the fact that the lower branches die leaving the top branches covered with fruit and when the tree falls the seeds are sown broadcast from the top.

All the Cypress trees of the Mendocino County coast grow on the "prairie" or "plains" region or in the forest adjoining the "plains". The bark is thin and gray in the larger trees but in the smaller trees it is brown and more fibrous. The bark seems to be laid on in strips and peels easily this time of the year. The bark remains intact while the tree lives but peels naturally after death. The wood splits easily and when dried out makes a good fire wood. The sap wood is from 1½ in. to 2½ in. thick in the larger trees.

Fort Bragg, January, 1914.

FROM SAN DIEGO TO THE BAY OF ALL SAINTS, LOWER CALIFORNIA, AND BACK.—NOTES OF A BOTANIST VISITING MEXICAN SOIL.

C. C. PARRY

A favorable opportunity recently offering to extend my observations, made nearly a third of a century ago in connection with the Mexican Boundary Survey, across the line then marked out dividing Upper from Lower California, was eagerly embraced.¹ Accordingly, a party of five, provided with a compact botanical outfit, early during the present month found themselves en route to a little-known district of our neighbor Republic. Unfortunately, political boundaries do not often indicate natural divisions of country, and not till we encountered, in the broad Tiajuana Valley, the Mexican Custom House officials, could we realize that we were entering a foreign land. Possibly for the reason that the botany of the route was clearly cosmopolitan, we were permitted to pass with slight in-

¹On this expedition there was collected a large amount of new material which has since become classical. The major-domo of the party was H. C. Orcutt of San Diego, assisted by his son, C. R. Orcutt. Here it was that the younger Orcutt acquired, under the influence of Dr. Parry, an interest in collecting plants and turned plant collector for life. Another member of the party was C. G. Pringle, a prince of plant-collectors, whose name was well-known to botanists everywhere.

The Orcutts were Sabbatarians and when it came the Lord's Day they proposed, as a matter of course, that neither man nor beast should travel. A fifth member of the party drew a gun and forced the Orcutts to proceed. It is unnecessary to say that neither the high-minded Parry nor the considerate and friendly Pringle had anything to do with this coercion.

Dr. Parry's narrative of this 1882 Todos Santos expedition has, we believe, never been published in any scientific magazine or journal, botanical or otherwise.—W. L. JEPSON.

terruption, the Mexican Administrator, on a brief explanation of our scientific objects, assuring us that the whole country was freely open to our investigation without further molestation. This same Tiajuana Valley, which has its outlet within the limits of the United States, affords the natural inlet to the whole lower country, its diverging branches draining the higher mountain slopes of the interior, and working its devious way among the irregular rocky ridges to the south. Along its lower course there seems to be a considerable body of agricultural lands adapted to irrigation, and the adjoining mesas would, no doubt, produce excellent fruits with the ordinary care applied to this class of products; in fact, the natural vegetation shows no difference to that which has yielded such rich results to northern enterprise; give it the intelligent population, the vigorous arm and restless enterprise of an Anglo-Saxon civilization, and it would not be long before its actual capacities would be developed. In this aggressive movement, however, of occupying new countries, the miner's pick generally precedes the farmer's plow, and it is to supply the demands of this adventurous class, that the more slow, plodding agriculturist occupies the land. One of the first results of mining enterprise is seen in the construction of roads to render the country accessible, and it was along the most traveled of these, leading southeast to the interior mining town of San Rafael, that our route lay.

After leaving the main valley our road passed over a succession of steep clay hills, bedded with a more or less luxuriant growth of native vegetation, in which patches of bright yellow flowers were conspicuous, which on a distant view might be taken for ripening grainfields; along the roadsides were extensive thickets of formidable cholla cactuses, interspersed with clumps of the Spanish bayonet (*Yucca baccata*), which served to keep in mind the true desert features. Only in the spring time, as we saw it, could anything approaching verdure be noticed in the near or distant scenery. The irregular divides lead down on the opposite slope, to valleys more or less extensive, along whose course the occasional presence of living water allows a limited settlement, generally indicated by small patches of grain, and scattering groups of cattle and horses, which latter comprise the available wealth of the country. The exclusive possession of the limited water supplies naturally controls the entire adjoining slopes of desert land, only fit for scant pasturage in the rainy season. With progress inland an increased elevation is apparent in a cooler atmosphere and more scant vegetation, still, however, maintaining its Californian character. The country becomes more rugged, the mountain slopes more rocky, and the hills steeper. We passed on the third day the "valley of palms", without, however, seeing anything but the dried stumps and withered remains of this Oriental vegetation, which would otherwise have given an interesting feature to the landscape. The species here met with is identical with the desert palm (*Washingtonia filifera*), which here makes its first appearance on the eastern slope of the mountain range.

A little beyond the elevated plain of Vallecito, now occupied by an American named Ryerson, we leave the main road leading to San Rafael, turning in a more direct southerly course toward the ocean. Here we encounter, in small upland valleys, attractive groves of live oak (*Quercus agrifolia*), and the hill slopes are adorned with a small ash tree of shrubby growth, properly designated as the "flowering ash", being closely allied to the manna-producing ash of Europe and the Orient. This arborescent species, then in the full glow of its glossy foliage and conspicuous white flowers, occupying the most bare arid slopes, would seem to be specially adapted to ornamental cultivation, though its timber product would be necessarily quite scant.

Descending again toward the sea, a milder atmosphere and increasing dampness again serve to freshen the vegetation, and we pass luxuriant growths of peculiar shrubbery, including sumac, California lilac (*Ceanothus*) and a beautiful willow-leaved manzanita not known farther north. Here, also, occurs a horse-chestnut² apparently different from the California species, being smaller and of more bushy growth; likewise an unknown shrub allied to *Euonymus*. Thence by a rapid descent we reach the ocean shore at All Saints Bay, where, at a place called Sauzal, we meet with an intelligent American family named Fish, by whom we were most agreeably entertained and welcomed to the comforts of a civilized home. The bay itself is a magnificent arm of the sea lying open to the southwest, but the ocean swell being measurably broken by an intervening barrier of rocky islands, affording a ship channel on either side. The port of Ensenada is located at the southern end of the bay, six miles from Sauzal. This is the most northern accessible harbor of Lower California, is the principal port of entry for this interior country, and is a regular stopping place for the steamers running from San Francisco to Guaymas once a month. The shores of the bay are mostly a pebbly shingle beach, on which there is too much swell for small sail boats, but below Ensenada is a long stretch of sandy beach, at which boats can be safely landed, and affording a magnificent beach drive. Along these winding shores, with occasional rocky projections, seaside naturalists would find abundant opportunity for prosecuting their researches in marine life, both animal and vegetable. The distinguished Spanish navigator who, in the sixteenth century, first visited these waters, apparently having previously exhausted the catalogue of saints, concluded to corral them all in a body by naming this "Bayia de Todos Santos" (Bay of All Saints) and so the name has come down to us. This bay is historically commemorated by the modern filibustering expedition of Walker, who came very near succumbing here, more to the barrenness of the country than the military forces that obstructed his way, his forlorn and shattered forces being rescued by an American war

²This was published by Asa Gray in the Proceedings of the American Academy of Arts and Sciences (17:200,—1882) as *Aesculus Parryi*, on the basis of material sent him by Dr. Parry.—W. L. J.

vessel, to meet with a still worse fate in the more tropical wastes of Central America.

Below Ensenada is a succession of small settlements striving to maintain a precarious existence, with an increased aridity of climate and more forbidding aspects of scenery. What may hereafter be developed in the way of mines and a limited agriculture will probably await political changes, or an invasion by that modern civilization—the railroad. It seems not a little strange that such a narrow peninsula, indented by navigable bays and washed by ocean and gulf along such an extensive shore line, should be abandoned to hopeless sterility. The adventurous history of the early Spanish missions on this coast should throw some light on the true resources of the country, and the difficulties which they encountered from hostile tribes and uncertain supplies should be measurably overcome by our modern appliances of rapid transportation. Useless as it always has been to Mexico, either as a source of internal strength or civilized development, its present scant population would seem to invite its absorption into that progressive Union that is now planted so firmly on the Pacific Coast. Then, with beacon lights blazing along her rugged coast, her harbor marked out with buoys, her interior country and mineral resources developed from ocean to gulf, we might see something more than a skeleton finger resting useless on the placid bosom of the southern sea.

Occupied with such imaginings, your correspondent, after pacing the shores of the Bay of All Saints, returned by the inland route, through San Rafael, an elevated basin 2,500 feet above the sea level. Thence by an intolerably rough road, destitute of verdure and scantily supplied with water, we again fell into our previous upward track, and terminating our pleasant and successful botanical trip by a refreshing bath in the Tiajuana hot spring, again found ourselves on American soil.

San Diego, April 22, 1882.

SOME POPULAR FALLACIES CONCERNING CALIFORNIA REDWOOD.¹

EMANUEL FRITZ

I doubt if there is a forest anywhere that receives so much public notice as our own California redwood forest. In their enthusiasm for the forest, however, many people have given their imagination so much freedom that some erroneous beliefs have developed. In the brief quarter-hour allotted to me, I can touch upon only a few of these fallacious beliefs. They are, the sizes of the trees, the age of the forest, the rate of growth of the trees and the influence of fires.

Sizes of the Trees.

So impressed are we apt to be with the huge size of individual trees, that we lose sight entirely of the greater number of smaller ones. A stranger may very easily be led to believe that the large trees predominate, and that small trees are in the minority, if present

¹ Read at the annual meeting of the Society on Feb. 23, 1929.

at all. Lumbermen themselves see only the big trees and pay little attention to the small ones. In fact, if a tree is not 24 inches in diameter, it is likely to be considered too small for profitable handling. In certain other forest regions, however, 24 inch trees would be considered of good size. Redwood trees do, of course, reach great proportions. The largest I have ever measured myself were a little over 16 feet in diameter, but these same trees locally are reputed to be 22 to 23 feet in diameter, because the layman measures the diameter of the tree at the ground line, whereas the forester does not credit the tree with the immense flare or swell of the stump portion and consequently he measures above it or at "breast height", which is $4\frac{1}{2}$ feet from the ground. A reliable observer told me recently of a tree 20 feet in diameter at "breast height", and doubtless there are more of such great diameter scattered here and there. Trees over 10 feet in diameter are really rather rare and are found only on river benches or scattered lightly elsewhere. During the past year, I had occasion to measure the trees on a 30 acre tract. This tract was typical and probably a good average of the Humboldt County redwood timber. The classification of the "breast-high" diameters of the trees on this tract gives the following data. Trees over 12 inches in diameter, 1263. Of this number, 18.9% are 61 inches or more in diameter, and 34.5% vary from 31 to 60 inches. 51.6% vary from 12 to 30 inches. Below 12 inches there are as many more trees as there are above that diameter. Those under 12 inches were not counted, but there are certainly much more than a thousand. You will see, therefore, that the giant trees are far outnumbered by the smaller ones. From a forester's point of view, it is important to know the relative abundance of each diameter class. In fact, the lumberman is interested in this also, although he can make a profit only from the larger trees.

Age of the Redwood Forest.

It is often said that the redwood forest is "thousands" of years old. The layman may thus come to believe that most of the trees in the redwood forest exceed several thousand years. I doubt, however, if there are very many trees over 2000 years old. The oldest tree of which I saw a cross section myself, was just under 2000 years old. This, of course, is not the age of the forest, but only the age of that individual tree. Such patriarchs, just like trees of large diameter, are very much in the minority. Incidentally, the largest trees are not necessarily the oldest, because there is a big difference in the rate of growth of individuals. Most redwood trees are much younger. I feel safe in saying that the bulk of them are under 600 years of age. I have often heard the redwood forest spoken of as being overmature, and some have even described it as being even-aged. Nothing is farther from the fact. There is not a forest in all the world in which there is such an inequality of ages and where

there are so many vigorously growing trees as contrasted to decadent trees. I venture the statement that if you find a 2000 year old tree, you will find on the same 40 acres, trees of many more ages down to very young seedlings. On the 30 acre plot already mentioned, we found a single tree which attained an age of 1380 years. The next oldest was aged 1246. These ages were all obtained at the stump and are therefore slightly less than the total age. We did not obtain the ages of all the many trees on this area because of burned-out centers, rot and other factors; also because very few of the many trees under 18 inches in diameter were cut down. Of the 567 trees on this little area whose ages were actually determined and whose diameter was over 18 inches, only 17 were found to be over 1000 years old. Tabulating the ages gives the following results:

0—	200 years—	unknown
201—	300 years—	108 trees
301—	400 years—	39 trees
401—	500 years—	81 trees
501—	600 years—	102 trees
601—	700 years—	67 trees
701—	800 years—	38 trees
801—	900 years—	34 trees
901—	1000 years—	31 trees
	1001 and over—	17 trees

I purposely left off the ages of the 1 to 200 year old class, because only a few trees under 18 inches in diameter were cut. If these had been included, there would be more than a thousand trees in this class. It is obvious from this that the redwood forest is very uneven-aged, that as a forest it is not over-mature, and that the ages of the individual trees vary widely from under 100 years to over 1000 years.

Rate of Growth.

You often hear it said that the redwood is a slow grower. In fact, when the forestry school first became interested in redwood forestry, the idea of replanting cut-over lands with redwood was laughed at by many of the local residents. It is common knowledge now that this species is really a very rapid grower if it is given a chance. In the virgin forest, of course, the trees have all kinds of competition. Their individual growth is, therefore, very slow—it might take 50 years or more to add an inch of wood. Without this competition, as would be the case in a well managed young forest, that same inch may require only three years. Virgin trees that have been dragging along for 400 years making only slow growth because crowded by neighbors may, if these neighbors are removed, suddenly change their rate of growth from extremely slow to extremely fast as is evidenced by the sample I have here. Thus, if redwood grows slowly, it is not the fault of the species but the fault of its environment.

The Influence of Fire.

How many times have those of you who have talked to old-timers in the redwood region, been told that fire doesn't hurt the redwood.

I have been told many times that fire is good for the redwood and that it actually stimulates their growth! Another fallacy. Fire never helped any forest permanently. Fires have run through the redwoods for centuries. On the 30 acre tract which we studied last year, we dated some fires back to the year 843, nearly 1100 years ago, and the scars as revealed on the stumps show there were dozens of additional fires since then, possibly two or three bad ones each century. Were it not for the fires of the past, the average tree would certainly be larger, and there would be probably 15% more timber—in fact you can say that fires of the past plus the ensuing heart rot have caused just that much loss to the lumberman. It is a peculiarity of redwood that it has no tree-killing insect or fungus enemies of any consequence, but fire is a real enemy. Just because a fire sweeping through a virgin forest does not lay low the entire stand, is not proof that great damage has not been done. On the 30 acre area which I have already described, we had a fire after we started our work, and although it did not burn through the entire 30 acres, it brought down 8 large trees. Fire, also, is the direct cause of most of the rather prevalent heart rot which causes so much loss of good lumber, to say nothing of the large holes burned into the butts of the trees, known locally as "goosepens". I hope I have impressed you with the fact that fire is a genuine enemy of the redwood forest and should therefore be kept out.

THE SANTA BARBARA MUSEUM OF NATURAL HISTORY

RALPH HOFFMAN

The Santa Barbara Museum of Natural History is an outgrowth of The Museum of Comparative Oology, which was founded in 1916 by W. Leon Dawson. In 1922, Mr. Dawson resigned as director, and, early in 1923, the Museum broadened its scope and began to exhibit birds, mammals, insects and flowers. In 1924, a department of archaeology was added. The trustees and the director of the Santa Barbara Museum have chosen to confine its exhibits and collections almost wholly to the local field, believing that a restricted field would give the Museum a wide enough scope and make it of the greatest value to the community. Before the Museum had any definite space for botanical exhibits, it put on each spring a wild flower exhibit in the patio. In 1927, Mrs. Clinton B. Hale gave a wing for botany and made provision for continuous shows of both native and exotic flowers. The wing was given in memory of Mr. Clinton B. Hale, who was particularly interested in growing rare trees and shrubs in Santa Barbara. The director began, in 1927, the collection of material for herbaria both of native and exotic plants. At the close of 1928, these herbaria included over 5000 sheets of native plants and over 3000 sheets of exotics.

¹ The introduction work of this pioneer plantsman is well described by Wilson Popenoe (Jour. Hered. 13:215) under the name of Dr. E. O. Fenzi, but with a reference to the name Franceschi. By this name the Doctor was universally known in California and under it was issued his catalogs of exotic plants.—W. L. J.

Santa Barbara has long had an especial interest in exotic flora. From the days of Ellwood Cooper and Joseph Sexton to the time of Dr. Franceschi,¹ it has been a favorite place for the introduction of new species from all parts of the world. There are now in the old Ellwood Cooper place, in the grounds of Mrs. M. M. Yates, in what was formerly the Kinton Stevens place, in Dr. Franceschi's former home, Montarioso, in the Gillespie and Hale places, on the grounds of Mrs. Thomas Bard at Hueneme and in Alameda Park, planted by Dr. A. B. Doremus, some of the finest specimens of rare trees and shrubs in California. Because of California's favorable climate, many species grow here in the open which are not hardy in the older centres of horticulture in the east. Such trees as the famous Lemon-scented Eucalyptus at Ellwood, the Cork Oak on West Montecito Street, and the Cape Chestnut in the Hale Place, are probably the finest specimens of their respective species in the United States. The herbarium of exotics, when completed, will be the basis for a check list of the exotics grown in Santa Barbara and a guide to the fine specimens of rare species.

Since the days of Nuttall and Greene, very little systematic collecting of native plants has been carried on in the Santa Barbara region. The mountains to the north have never been thoroughly explored. No one knows where the desert flora, which pushes past Mt. Pinos into the upper Cuyama Valley, merges into the transition zone. Even in the short time that has elapsed since the herbarium was started, a number of interesting finds have been made. The type locality of *Cheilanthes cooperae* has been rediscovered. The remnants of a northern flora, as exemplified by such species as *Vaccinium ovatum*, *Osmaronia cerasiformis* and *Lithocarpus densiflora* have been discovered in several localities. *Comarostaphylos diversifolia* is now known to occur at scattered points on the mainland. A flourishing stand of *Adenostoma sparsiflora* has been re-discovered (Baker collected a specimen but did not, so far as the writer knows, publish the occurrence).

The Museum has a Botanic Garden of fifteen acres which has been planted to trees, shrubs and herbs of the Pacific Coast. The ground has lent itself to the segregation of these in eight associational groups, those of the Redwood belt, those of the grass-land, those of the Santa Barbara Islands, those of the desert and so on. The site of this Botanic Garden is remarkable for its beauty and for its historic interest. It has a view of the mountains to the north and of the sea and the Santa Barbara Islands to the south, and contains the well preserved remnants of the dam built by the Indians in 1779 to furnish water for the Santa Barbara Mission.

The nucleus of the Museum building was built, in 1923, by Mrs. R. G. Hazard, on land given by Miss Caroline Hazard. It was a cousin of Mr. R. G. Hazard and Miss Hazard, namely Mr. Barclay Hazard, who helped Dr. Greene in 1886 to make his pioneer exploration of the Channel Islands. This service to botany is commemorated by the name *Hazardia*, given by Greene to a new genus which he separated from *Aplopappus*.

OPEN LETTERS

A large *Quercus agrifolia* tree in Santa Clara County

On a ranch four miles west of Gilroy is a very large Live Oak tree, a perfect symmetrical specimen without a sign of rot. Its maximum crown spread is 123 feet and the minimum spread 110 feet. It has a height of 87 feet 6 inches. At the ground the trunk is 37 feet 6 inches in circumference; at two feet up, it is 30 feet in circumference; at five up it is 27 feet 6 inches in circumference; eight feet up, it is 30 feet 9 inches in circumference. The trunk then branches into three evenly spaced limbs. These limbs at about ten feet up are respectively 15 feet 6 inches, 14 feet 5 inches, 13 feet 7 inches in circumference. These dimensions appear to be larger than those for any oak given in Jepson's *Trees of California*.—W. J. HANNA, Reaoks Ranch, Gilroy, Oct. 14, 1924.

NOTES AND NEWS

A region which is compared to a distorted ellipse indicates the bounds of an Annotated Flora of the Chicago Area by Dr. H. S. Pepon. About 45 miles wide, extending from Mt. Tom to the Waukegan Moors, the region is divided into six floral areas, the vegetation of each of which is described in relation to the topography and edaphic factors. A systematic list with keys follows. The book, well illustrated by photographs, is an admirable production. It forms Bulletin Seven of the National History Survey, Chicago Academy of Sciences. It may well serve as a model for similar great population centers where an interest in nature study on the part of the general public needs to be satisfied.—W. L. J.

Mr. Knowles A. Ryerson, formerly of the agricultural department of Los Angeles County, was in 1928 appointed chief of the Office of Foreign Plant Introduction of the United States Department of Agriculture at Washington, D. C.

Dr. Ralph W. Chaney of the Carnegie Institution gave three illustrated lectures on the history of *Sequoia gigantea* in Giant Forest, Sequoia Park, July 4 to 6.

"A Spring Flora of Northwestern Oregon" (153 pages) has been issued by Dr. Helen M. Gilkey, Associate Professor of Botany in the Oregon State College, Corvallis. It contains a single key to all the included species and is fully illustrated, being designed to help beginners to help themselves. As an introduction to a study of the flowering plants of Oregon the book will, we believe, be highly welcome and of real value to the increasing list of persons interested in the native vegetation of the woods and fields of that region.

MADROÑO

JOURNAL OF THE
CALIFORNIA BOTANICAL
SOCIETY



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September, 1929

MADROÑO

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The purpose of this Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora; and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographical distribution of the native plants will be especially welcome.

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CALIFORNIA BOTANICAL SOCIETY

The purpose of the Society is to promote the botanical study and investigation of California plants, to diffuse knowledge concerning them, and by lectures, field-trips, exhibitions and publications to deepen interest in the native flora amongst the people of California.

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The Annual Dues are \$2.00 which should be remitted to the Treasurer, California Botanical Society, Botany Building, University Campus, Berkeley, California. Back numbers of the Journal may be had from the Corresponding Secretary, Botany Building, Berkeley, California. Subscription price \$3.00 per year.

BOTANICAL TRAILS IN OLD MEXICO.—THE LURE
OF THE UNKNOWN.

YNEZ MEXIA

In 1926 I enthusiastically planned a botanical collecting trip to the western states of Mexico with the idea of exploring the more remote districts where I felt sure collectors had not penetrated and where I hoped to secure interesting and possibly new plants from the rich flora of that sub-tropical region. I was to collect under the auspices of the Department of Botany of the University of California and the permit kindly issued me with the great golden seal of the University visibly impressed the always courteous officials of our southern neighbor even when they were unable to decipher the document.

All preparations being completed in September of 1926, I left San Francisco on the very comfortable Pacific Mail steamer. Four days of pleasant sailing brought us opposite the tip of Lower California, where we turned due east across the Gulf of California to Mazatlan, the port of the State of Sinaloa. There I was met by a very good friend, Mr. J. Gonzales Ortega, by profession a civil engineer, who has also been an enthusiastic botanist for very many years. This gentleman knows the west coast of Mexico as few know it, and has been most helpful in advising me as to the best localities for collecting.

My first trip out from Mazatlan was to Tepic, in the State of Nayarit. Tepic lies in a fertile valley in the range of the Sierra Madre mountains at an altitude of about 1000 meters. While on the new line of the Southern Pacific Railroad, it is as yet a very beautiful quaint old city, happily little touched by modern "improvements". The streets, when not consisting of mudholes, are cobbled and bumpy, with houses and walls of adobe on either side, but the houses are far apart, each set in its garden or "huerta", and the red tiled roofs nestle picturesquely among the tender greenery of the bananas, or the dark glossy green of the omnipresent coffee plants. Even the adobe walls become things of beauty in this ideal climate, for they are covered with a garment of Maiden-hair fern, while above them droop the branches of flowering or fruiting trees.

A gentleman to whom I had letters provided me with a reliable "mozo" or guide and a couple of horses, and I set out each morning to explore and collect. As I had never been in this region before, I found the luxuriance of the vegetation actually embarrassing. It was hard to know where to begin to collect and still harder to know when to stop. Mauro, my mozo, and I would ride out along a road, and then cut off over some little trail that led towards the higher mountains. The Guava trees, *Psidium Guajava* L., which grow wild, were in fruit and we would stop to eat and to fill our pockets when we came across them. Ferns were very abundant, growing along the trail banks and in every little ravine. *Athyrium Skinneri*

(Baker) Moore and *Adiantum Braunii* Mett., were among them. Convolvulaceae of every size and color were everywhere along the hedgerows and clambering over shrubbery and small trees, very ornamental, but a terrible pest to agriculturists. The scandent milkweed, *Dictyanthus Pavonii* Decne., climbed over the thickets showing its beautifully veined purple and brown campanulate flowers. The wild fig-tree, *Ficus mexicana* Miq., here grows to huge proportions. As the green fruit hung high, Mauro deftly lassoed some fruiting branches for me.

A trip along the trail leading to the village of Jalcojotan took



Fig. 1. The Oil-nut Palm. *Attalea cohune* Mart. The nuts, about the size of an egg, are composed of an outer fibrous husk, a thin layer of orange-colored pulp and a thick stony shell containing a plump kernel which is an important source of oil, mostly used locally for the manufacture of a coarse soap. All through the Palm forests one finds mounds of these shells, broken open with stones by the patient natives.

us up into the Cordillera where we found interesting mountain flora. It was the only locality in which I found the *Prochnyanthes viridescens* Wats., a most beautiful plant with twin dark red bells growing along a scape two or three feet tall; it superficially resembled our *Fritillarias*. The *Cosmos* that brightens our gardens is one of the common wild flowers in Mexico, and the pink *C. Seemannii* (Sch. Bip.) Gray starred the openings in the woods, while the tall dark scarlet *Dahlia coccinea* Cav. flamed everywhere against the green of thicket or shrub. In a beautiful little glade between the hills was a veritable flower garden, bright with the red-orange *Zinnia linearis* Benth., a beautiful white *Hymenocallis* and the scarlet bracts of the *Euphorbia colorata* Engelm. The tall *Macromeria exserta* D. Don spread showy pale yellow flowers against the dark green of the hillside where the white blossoms of *Passiflora sicvoides* S. & C. and its trilobate leaves festooned the lower trees. Growing in the neighboring tangle I found a perennial herbaceous composite, height about 60 cm., with conspicuously winged stems and flowers an inch across, lemon yellow in color. This has turned out to be a new species, *Verbesina pantoptera* Blake, (type no. 1317608 U. S. National Herbarium). The *Hibiscus* grows wild in the denser woods and brightens the shade with its crimson blossoms. I collected several kinds, one bearing a dark red flower being new, named *Hibiscus aniaster* by Mr. Paul C. Standley.

One day we went to the Cerro de San Juan, the nearest spur of the Cordillera, up an almost obliterated trail said not to have been used since the mountain was a stronghold of bandits during the revolution a few years ago. The stream up which we worked was arched with many strange deciduous trees where a delightful but elusive fragrance kept me seeking until I traced it to the lovely creamy blossoms of the *Clusia Salvinii* Donn. Smith., a rather small tree with thick glossy leaves and a smooth trunk. Many ferns and mosses grew in the dense shade beneath and among these were beautiful bright pink *Sobralia decora* Batem. (probably), (det. Oakes Ames), and a new *Begonia*, *B. ornithocarpa* Standl., in fruit. When we descended from the mountain our trail led us over the more level ground, with occasional clumps of small trees and thickety growth. One shrub, named "Pie de Pajaro" by my mozo, had abundant green fruits, in axillary umbels, and, proving to be a new species, has been called *Deppea macrocarpa* by Mr. Standley.

After two weeks collecting in Tepic, I went southwest to Yxtlan del Rio lying somewhat higher in the mountains, and with the aid of a very good mozo, Juan, collected around there. By riding up the sides of the mountains we got into the lower fringe of the oak and pine belt. In the openings of these woods many composites were now in flower. On the more sunny slopes we found cacti, among others, a red-fruited *Cereus* sp. This latter strikingly demonstrates in what manner the slabs lose their spines and shape and become trunk-like as the cactus approaches tree form in age.

An attractive spreading tree with glossy leaves and large white flowers opening in the late afternoons proved to be one of the strange

Morning-glory trees, *Ipomaea murucoides* R. & S., while in a pasture in the valley a new nightshade was found in fruit, *Solanum Nayari-tense* Standl.

Returning to Mazatlan with my collection, my next excursion was farther south to Tuxpan, in the State of Nayarit. This was on the Rio San Pedro, one of the largest rivers draining into the Pacific Ocean which in flood inundated the whole territory in 1925. The soil in this part of the country consists of alluvial deposits brought down by the river, and its fertility is incredible. Crops (and weeds) grow almost overnight. There are great "Palapares", forests of the Oil-nut Palm, *Attalea cohune* Mart., which are most beautiful, and so luxuriant that not even a ray of the tropical sun can penetrate their canopy at midday. The shade is so dense that only the young palms and an odd, broad-leafed maiden-hair fern, *Adiantum latifolium* Lam., can flourish there, but around the margins of these forests there is a fringe of other trees and shrubs. Among those collected was a composite, a large coarse erect freely branching plant, suffrutescent, about two meters in height with orange-colored heads borne on rather long pedicels. This has been named *Zexmenia Mexiae* by Dr. S. F. Blake, (type no. 1317609, U. S. National Herbarium) and was called "Tacote Amarillo" by my mozo.

The prevailing family here is the Leguminosae, and its representatives occur in every form from tiny little ground runners to great trees. Leguminous shrubs, many of them sharply hooked, are in legions, and vines and scandent shrubs make progression except along trails most difficult.

From Tuxpan I took a dugout canoe down to the Mexcaltitlan, a little village of shrimp-fisheries in the delta of the San Pedro, and there encountered large and active Anopheles and the "Jejenes" or biting gnats which feast on stranger and native alike. The village was on a small island in the vast shallow lagoons which stretch along this coast for leagues and leagues. Lovely blue Water-lilies, *Castalia elegans* Greene, grew by the acre and the Corpus Christi, *Nelumbo lutea* (Willd.) Pers., lifted its stately white flowers and spread its immense pads in the sunshine. The lagoons, fresh to brackish, were everywhere broken by what looked like wooden islets, which when approached turned out to be association of water-loving trees: Mangrove, *Rhizophora mangle* L.; the Buttonwood, *Conocarpus erectus* L.; *Phyllanthus acidus* (L.) Skeels and others, all growing in the shallow water. In places these trees were so smothered by vines, principally Convolvulaceae, that they lost all tree shape and became but living green mounds. Collecting was done from a canoe, and though the individuals were countless in this delta region they represented few species, so as soon as I had collected these I was glad to escape from the mosquitoes and the odoriferous shrimp and return to Tuxpan and to Mazatlan.

My next trip was to Los Labrados, about thirty miles south of Mazatlan in the State of Sinaloa. Here I was in the thorny coastal jungle. Leguminosae predominated in tree and shrub form, the

Acacias being especially abundant. The rose-pink "Coronilla", *Antigonon leptopus* H. & A., fairly covered the landscape, wreathing every thicket with its beautiful pink sprays, and the *Convolvulaceae* in many colors smothered the thickets and trees up to 75 feet. The strange "Tree Morning-glory" bears its typical white flowers while the branches are yet leafless, but does not here come into flower until December or January.

My next venture took me by steamer down the coast to far-away Puerto Vallarta in the State of Jalisco. Here I collected for a month, near the coast and in the foothills. The *Lantana*, *Lantana camara* L., called here "Señorita", is most abundant and it is always interesting to meet one of our garden favorites growing wild. Many epiphytes are seen in the higher trees. A large-leaved tree of the same family as our *Rhus*, *Comocladia Engleriana* Loesener, unfortunately not in flower or fruit, was collected with disastrous effects to my mozo as it put him out of commission for a week with badly swollen and inflamed face and hands. This tree is called "Hincha-huevos" by the natives, because they have the notion that an egg coming in contact with any part of it will burst. Another tree named "Manzanita" from the small, apple-like fruits was shunned by my mozo. This is the *Hippomane mancinella* L. of the *Euphorbiaceae*. Neither of these trees affected me.

Climbing around the precipitous hills rising abruptly from the water's edge, I found in the understory of the dense woods a small tree, luckily both in flower and fruit, which proved to be new, *Eugenia Mexiae* Standl. A *Piper* growing in this same dense shade showed large oblong oblique leaves and the cord-like spikes that have caused the natives to call all the pipers "Cordoncillo". Dr. Wm. Trelease has named this *Piper* *Ynesae*. A little higher on the slope where the trees thinned out, a struggling shrub curiously like our Elderberry in appearance showed dense clusters of rich purple drupelets. It proved to be *Callicarpa subpubescens* Hook. & Arn., of which the type is "said to have been collected in Tepic" in 1840, and which has not been found since.

An interesting side trip I made was in a dug-out canoe by sea some twenty or thirty miles down the coast to a little cove named Quimixto inhabited only by seven very poor families. The country was very wild in this locality, and I stayed five days or until my collecting equipment was all used up. The heavily wooded hills showed in the main the same species as farther north, but another new *Eugenia* turned up, *Eugenia pleurocarpa* Standl. It showed a large, dark purple, ridged fruit, said to be edible. I collected the same thing later in the Sierra Madre Mountains at an elevation of about 2000 meters, but nowhere was it abundant. Another new shrub, *Cephaelis sessilifolia* Standl., had sessile, oblong leaves and a striking bright blue drupe in large bilobate deep red bracts. In this locality I collected also another new *Piper*, named *Piper Quimixtense* by Dr. Trelease. I fear the simple inhabitants of Quimixto will never know of the honor done their hamlet. A new *Rousselia* found here has not yet been named.

It might seem appropriate that in this most remote and hidden nook of this out-of-the-way corner of the world, that I should have collected among other composites one that has turned out to represent a new genus. On December 1, 1926, my mozo, Reyes, and I followed the little river some distance and took a trail that wound up the steep forested volcanic mountains that here pitch directly down to the ocean. After climbing for two or three miles we came to a small stream, "El Arroyo del Chorillo", named thus from a little waterfall higher up, and working down this stream a bit collected this plant among others along the sandy stream-bed. It grows to about a meter in height, is suffrutescent to woody below and has small globular heads of white flowers.

This specimen was sent for determination among a number of Eupatoriums to Dr. B. L. Robinson, of the Gray Herbarium, Harvard. I quote from his letter:

"You will be pleased, I think, to notice that there was a new genus among these, namely no. 1202, which is a very interesting plant curiously simulating *Eupatorium monanthum*. I have been pleased to name it in your honor and have called it *Mexianthus mexicanus*, in the hope that its cheerfully alliterative appellation will be easily remembered and will keep in mind your noteworthy service in exploration."

Returning to Puerto Vallarta I next went to the almost uninhabited and precipitous foot-hills of the Cruz de Vallarta, altitude about 700 meters, where I stayed at the hut of a wood-cutter, setting up my cot in his banana patch. Of course, maize is the staple crop all over the Republic, with tobacco on the hot coastal belt and coffee at higher altitudes, but each little wattle-and-thatch hut on the hills has its patch of sugar cane and bananas, much as we at home grow a garden of potatoes and corn. The hills were heavily wooded, there being many valuable hardwoods on these slopes, while in the dense shade flourish numerous flowering shrubs. The flaming red flowers of *Pedilanthus Palmeri* Millsp., resemble tiny candles in the gloom. Up to this time the plant had only been reported from its type locality, Tepic. A small tree of the understory growing on the steep side of a cañon showed minute white flowers and panicles of little orange and red drupes. This has been named *Psychotria Mexiae* by Mr. Standley.

Exploring these volcanic mountains was somewhat strenuous as most of them are standing on edge. The woodcutter's boys were the companions of my rambles and a thirteen year old would climb any tree of not too great girth by clasping it with his arms and half walking, half hitching his way up.

Near a streamlet in a deep cañon we found a tall herbaceous plant, an *Euphorbia*, with small pale green leaves and tiny greenish flowers. My curiosity was aroused by the importance given it by my native friends, who call it "Hierba del arlomo" and who stated that it was a specific for the bite of the dreaded "arlomo". It took a good deal of investigating to discover what an "arlomo" was but

I finally made out that it was an insect that occasionally stung human beings, and that the limb of humans thus attacked become excruciatingly painful and swollen, gangrene sometimes setting in and the limb or life itself often being lost from the effects of the poisonous bite. One of the proofs of the malicious character of the arlomos was that at night it gave out two greenish points of light. Later near a stream I discovered an arlomo, evidently a glow-worm, bottled it, in spite of the remonstrances of my guide, and brought it home for identification. Dr. E. C. Van Dyke, entomologist, declares it to be a female glow-worm, family of the Cantharidae (Lampyridae) and absolutely harmless. However there can be no doubt that occasionally people are bitten with fatal results, but Dr. Van Dyke considers the culprit to be generally the Black Widow or Hour-glass Spider, *Lactrodictus mactans* Fabr., which is extremely poisonous.

The reputed curative herb, however, interested me, even if I doubt its efficacy, so that I have been anxious to get its identification and find out some of its attributes. I was therefore somewhat surprised to learn that it is a new species, now bearing the name of *Euphorbia Mexiae* Standl.

On my return to Puerto Vallarta there was no steamer to take me back to Mazatlan so I went three days journey over the passes by pack train to the crest of the Sierra Madre, here running up to about 7000 feet. My destination was the old mining town of San Sebastian, nestled in the valley of the same name just under La Bufa, the highest peak in this region. This valley is just below the frost line, while the temperature drops to the freezing point on the overhanging crests. The climate is delightful; bracing, clear and sunny in the daytime, but sharply cold at night, and crops and fruits from both tropical and temperate climes grow here abundantly.

The mountains are very rugged and steep, cut into many narrow, deep cañons by the clear streams that come tumbling down from the crests. These cañons are crowded with deciduous trees and shrubs, but the slopes and crests are clothed with open pine and oak forests. The varieties of oak are legion, among them some of the largest and most stately oaks it has been my fortune to see. The pines are also of many species, all that I found but one, being five-needled, and quite different in habit from those of more northern climes. They have not the pyramidal form so marked in our conifers but are quite umbrella-shaped with spreading branches and mostly open foliage, the very slender flexible needles fully fifteen inches long. The tufts of needles ripple in the breeze and catch the glint of the sunshine as our shorter-leaved pines cannot do.

The undergrowth shows innumerable species of the Labiatae and many Compositae. In the valleys black walnuts grow to a size unknown to us, while ashes flourish mightily. Avocados and lemons grow wild. Milkweed, *Asclepias elata* Benth., and the "Tomatillo", *Bunchosia Palmeri* Wats., with its yellow fruits, are common along the trailsides, while the fragrant little pink, lily-like flowers, *Sabbatia gracilis* Salisb., fairly star the hillsides.

A few new species were discovered in this mountainous region both on the mountain slopes and in the steep cañons. Along the banks of the "Arroyo de las Casillas" in the shade of the higher trees overhanging the clear stream was a slender tree of the Malvaceae, showing beautiful canary-yellow blossoms and the great broad leaves which have induced Mr. Standley to name it *Pavonia amplifolia*. *Deppea hamelioides* Standl., was discovered along the banks of the Arroyo del Monte Oscuro, so called because the ravine is so deep that the stream is perpetually shaded. It is a slender herb, in fruit when collected, showing open clusters of small capsules. In the dark, shady cañon of Arroyo Segundo, the oaks had their trunks and horizontal branches covered with a luxuriant moss growth, and in these lush beds were small succulent plants, about fifteen cm. high, with erect stems and symmetrical spreading tops for all the world like miniature trees. Dr. Trelease has named them *Peperomia Mexiae*.

On the trail to Real Alto, in an opening of the oak forest here clothing the slopes, the bright orange flowers of a shrubby composite were collected. Dr. Blake has named it *Verbesina heterocarpa*. On the dry ridge, Loma de Garrote, scantily clothed with stunted pines, *Sphacele pinetorum* Standl., was found. It had a deep taproot, was from one to two meters in height, with several woody stems and brick red flowers. I never found this shrub again. It was interesting to note that while along the coast the Leguminosae dominated the flora, at this altitude (between 1500 and 2500 meters) the Compositae have the greatest representation.

On the trail from San Sebastian to Real Alto, a scandent shrub of about three meters climbing over a thicket showed insignificant white flowers and soft densely pubescent foliage, so is named *Allophylus mollissimus* Standl. Another novelty was a tall composite with no rays, yellow-green disc flowers and grey-green smooth leaves called *Verbesina glaucophylla* by Dr. Blake.

The highest peak of the Sierra Madres here is La Bufa, 2500 meters, and just below the last rocky point are a few little huts, the remains of an ancient mining village. Here I came for a week with my mozo, Jose, and we sallied forth daily to collect. Among the rocks of these high peaks we clambered, every day finding new treasures. Twice we were lost and had to find our way back to the village in the dark as best we could, but it was all enjoyable too, and the scenery was magnificent. In the crevices of the rocks on La Bufa a plant was found with long straggling branches and bright red tubular flowers, but leafless. It is now named *Fuchsia decidua* Standl. Clinging to the rocky slope an odd composite showed a tuberous root and somewhat insignificant flower, but rather remarkable triangular leaves. It proved to be a new species, so it is now *Cacalia trignophylla* Blake. The north slope of La Bufa is not so steep and is densely wooded, there I found a rare little trailing plant with broadly obcordate leaves and pale pink, fringed blossoms. *Drymaria excisa*, Mr. Standley has called it.

After collecting and exploring along the crests I followed down the streams as far as it was possible to go, for one is always climbing up or down in this precipitous country, and on crossing a little rivulet with its fringing vegetation, my attention was drawn to tall shrubs with scanty leaves and showy corymbs of deep crimson flowers, unlike anything I had ever seen before, and which I never found again. They have turned out to be of the family Capparidaceae, and Mr. Standley has named them *Cleome atrosanguinea*.

Returning to San Sebastian I took the trail to the Hacienda del Ototal, dropping down to an altitude of about 1500 meters. Here



Fig. 2. "Organo". *Lemaireocereus montanus* Britt. & Rose. Found on dry hillsides at Yxtlan del Rio. The fruits or "Pitajayas" are important summer articles of food among the poor. Growing high on the stems they are nipped off by a pair of long bamboos fastened to function like elongated shears.

the more tropical vegetation of the coast came up to meet the temperate flora of the high mountains. Bananas and sugar cane were raised at the Hacienda, but there were occasional light frosts. On the way down I found among the undergrowth near a stream tall Solanaceae, with large soft cordate leaves and yellow flowers. This is now named *Bassowia malacophylla* Standl. I collected in the vicinity of the Hacienda for ten days and a number of new species rewarded my efforts. *Randia concinna* Standl., a large tree with fruits (green) the size of small lemons, grew on the thickly wooded slopes, and *Abutilon jaliscanum* Standl., a fine salmon-yellow large flowered shrub, grew in dense shade by the stream bank. The determinations of a number of other species have not yet been made, so there are probably some other new ones among those set aside for study.

Above a shady little pool of the Arroyo de los Tapeistes, overhung by a yet undetermined *Saurauia*, was a lovely clump of rose-pink *Begonias*, described by Mr. Standley under the name of *Begonia Mexiae*. The following day a steep climb up from the valley where the Hacienda is situated brought us to the Arroyo de los Hornos near where *Rynchosia tarpantha* Standl., was discovered trailing long stems over the ground and whose long tap-roots required much digging. The yellowish green flowers were inconspicuous. This locality gave us another new species in the Melastomaceae, *Conostegia jaliscana* Standl. It was found by the side of the streamlet and was a handsome shrub from two to three meters in height, with large five-nerved leaves and a panicle of white flowers.

In the sandy bed of the Arroyo del Ottotal a single specimen of a rather tall herbaceous composite was collected. It had broad, rough leaves and cymes of deep orange flowers. Dr. Blake has called it *Trigonospermum hispidulum*.

On the return trip from El Ottotal to San Sebastian I discovered a small to medium sized tree showing clusters of white flowers whose leaves were oblong and densely tomentose above and below, at least when young. This proved to be a new relative of our Toyon Berry, *Photinia oblongifolia* Standl. Jose, my guide, stated that the wood was tough and durable, being used for axe handles, and that it was called "Escaramuza" by the country people.

I have made no mention of the ferns, of which I found many and varied species, but will have to talk about those another time. Besides the ferns many lichens, liverworts and mosses were collected, two of the latter proving to be new. One grew on the trunks of the palm trees (*Attalea cohune* Mart.) at Tuxpan and is named *Isopterygium dimunitivum* Bartram. The other, *Merceyopsis mexicana* Bartram, was found near a stream on a large rock in the valley of San Sebastian.

There was no end to the collecting, in these beautiful mountains and the bulk of my collection was made in this region. Three months slipped away before I knew it, and it was past time for me to make my way out. It was a three days pack mule trip to the railroad

over a rough and dangerous trail. The path zigzags down into the tremendous cañon of the Ameca and fords the river seven times. As we dropped down into the hot cañon bottom I saw from afar a grove of the Ironwood trees, *Guaiacum Coulteri* Gray, covered with their deep sky-blue fragrant flowers, and I only wished all my botanically inclined friends were with me to enjoy them and the rest of the beautiful Mexican flora as much as I did.

About 1600 numbers of plants were collected, consisting of lichens, mosses, ferns, grasses, herbs, shrubs and trees. One new genus was found, and so far as known at present about fifty new species. All the reports are not yet in. My itinerary follows.

Itinerary of Collecting Trip in the Western States of Mexico From Sept. 2, 1926 to April 19, 1927.

STATE	TOWN	DATE	
Sinaloa	Mazatlan	Sept. 2, 1926	Arrived at Mazatlan
"	"	" 8	Train to Tepic
Nayarit	Tepic	" 9-14	Environs of Tepic
"	"	" 15	Trail to Jalcojotan
"	"	" 17	Trail to Cerro de la Cruz
"	"	" 19	Cerro de San Juan
"	"	" 20	Trail to Acapaya
"	"	" 22	Train to Yxtlan del Rio
"	Yxtlan del Rio	" 23-25	Environs of Yxtlan
"	" " "	" 26-27	Trail to Barranca del Oro
"	" " "	" 29	Trail to Juanacata
"	" " "	Oct. 1	La Cofradia
"	" " "	" 2	Trail to Juanacata
"	" " "	" 4	Train to Mazatlan
Sinaloa	Mazatlan	" 5-11	At Mazatlan
"	"	" 12	Train to Los Labrados
"	Los Labrados	" 13-16	Jungle and Marisma
"	"	" 17	Train to Mazatlan
"	Mazatlan	" 17-21	At Mazatlan
"	"	" 22	Train to Ruiz
Nayarit	Ruiz	" 23-24	Environs of Ruiz
"	"	" 25-26	Dugout canoe to Tuxpan
"	"	" 27-28	Dugout canoe to Mecaltitlan
"	Mexcaltitlan	" 29-31	Lagoon collecting in canoe
"	"	Nov. 1	Dugout canoe to Tuxpan
"	Tuxpan	" 3-4	Environs of Tuxpan
"	"	" 5-6	Palapar Redondo
"	"	" 7	Hacienda del Conejo
"	"	" 8	Hacienda de Ybarra
"	"	" 9	Automobile to Ruiz
"	"	" 10	Train to Mazatlan
Sinaloa	Mazatlan	" 11-19	Environs Mazatlan
"	"	" 20-21	Steamer south
Jalisco	Puerto Vallarta	" 23-26	Environs Puerto Vallarta
"	" "	" 27	Cerro de la Cruz
"	"	" 28	Dugout by sea to Quimixto
"	Quimixto	" 29	Monte
"	"	" 30	River border
"	"	Dec. 1	Arroyo del Chorillo
"	"	" 2	Trail to San Pedro el Tuito
"	"	" 3	Dugout to Puerto Vallarta
"	Puerto Vallarta	" 4-6	

"	-----	"	7	Donkeyback to hills of Santa Cruz de Vallarta
"	Santa Cruz de Vallarta	"	8-12	Densely wooded hills
"	-----	"	13	Donkey to Puerto Vallarta
"	Puerto Vallarta	"	14-16	
"	" "	"	17	Rio de Cuale
"	-----	"	18-27	Awaiting transportation
"	-----	"	29-31	Mule pack to San Sebastian
"	San Sebastian	Jan.	1-27, 1927	Surrounding country
"	Real Alto	"	29-Feb. 3	Surrounding country
"	San Sebastian	Feb.	4-13	Surrounding country
"	Hacienda del Ototal	"	14-16	Surrounding country
"	Real Alto	"	18-27	Surrounding country
"	Hacienda del Ototal	Mar.	2-10	Surrounding country
"	San Sebastian	"	11-13	Surrounding country
"	Las Mesitas	"	14-17	Surrounding country
"	San Sebastian	"	18-27	Surrounding country
"	-----	"	26-28	Pack train through Los Reyes to railroad
Nayarit	San Jose del Conde	"	29	Arroyo San Jose del Conde
	-----	"	30-31	Train to Mazatlan
Sinaloa	Mazatlan	Apr.	1-18	At Mazatlan
	-----	"	19	Left for San Francisco

Berkeley, Sept. 20, 1928.

THE AVOCADO, A NATIVE AMERICAN TREE FOR HOME PLANTING

W. T. HORNE

Most of us have heard someone say, "I'm crazy about avocados. Do they grow on a tree? Do you think one would grow in my yard?" If it's in California, generally it might. How may we know where it is reasonable to expect or to hope for success with this most unique fruit tree? It would take a long time to give all our opinions and guesses and to tell what we do not know, but where an orange tree will live we might at least try an avocado. This would mean that by far the greater part of the people living in California might try it. In the extreme desert it is said to fail though the orange may succeed.

As to soil requirements we may say it likes good soil—probably somewhat as the sweet cherry. Over large areas of country it grows about as healthily as a cottonwood tree but there are other extensive areas where, if planted, either promptly or finally it dies, without certificate or permit of the pathologist. If we say it is due to deficient drainage we express an opinion which may divert attention from our lack of accurate information. Work under way by Dr. Haas at the Citrus Experiment Station, Riverside, indicates that it is not a plant for alkali or salt, either in the soil or in the irrigation water. It is my belief that the avocado will usually succeed better than an orange in a lawn, a dooryard or an ordinary home garden.

Before we go farther we might stop to ask about the particular qualities of this tree and what its service might be in one's home yard; or estate, if one should be more fortunate. In other words,

what particular forms of pleasure might it contribute to a garden enthusiast?

In general the avocado is a heavy foliated, evergreen tree with rather large ovate or elliptical to lanceolate leaves. Blossoming is often extremely copious, the flowers being small and on close inspection bearing much resemblance to those of the California Umbellularia (a botanical ally), but instead of yellow and green they show white and green. The fruit also tends to conceal itself among the leaves so that neither flowers nor fruit claim especial decorative merit. A number of varieties have been named and part of these are available from nurserymen. Among them there is considerable variety in figure of tree, color, and behavior. Seedlings are easily grown but they are uncertain as to character of tree and fruit and as to fruitfulness. It would seem that all avocado fruits are good, but the rest of the Scotch saying holds.

In a home yard usually a certain space is available. If there is ample room a "Fuerte" tree may be planted. This is the only fully approved variety for commercial planting, as judged by the qualities of the fruit. It is the medium sized, pear-shaped, green fruit seen during winter and spring on our markets. It is generally conceded that no variety excells it for merchandising or eating purposes. The original tree was discovered at Atlexco, State of Pueblo, Mexico, in 1911. The tree is broad with twigs and leaves drooping but it also grows up well. Leaves are large, long, lanceolate, flat, slightly bronzy at first, becoming a good full green. A leaf before me has petiole $2\frac{1}{2}$ inches long, blade pointed at each end and 8 by 3 inches. While the tree is hardy, another variety may be better in some places.

If one should desire a tree which would come more quickly to a size suitable for the children to build a play house in its branches, then one might choose a "Dorothea", a tree and fruit in many ways like the "Fuerte" but with stronger more sturdy limbs. Or one might choose a "Queen", if cold conditions are very favorable, a large, broad, handsome tree with very large summer fruits esteemed of the finest quality. Or, again, one might have a "Ganter", one of the hardiest and most vigorous of all and with many small light green autumn fruits. If the space suggests a broad low tree the "Knight" would be a worthy candidate. Its aspect is dense, dark green, with the new growth bright yellow washed with brilliant red giving a handsome contrast. It has large oval summer fruit. A beautiful dome shaped tree when young, with large, crowded characteristically curving leaves is the "Nabal". This is one of the later Popenoe introductions with summer fruit of medium size which promises well commercially. The variety which is perhaps second to the "Fuerte" in esteem of the merchant is the "Puebla". It will be seen about Thanksgiving time, a little smaller than "Fuerte", pear-shaped, smooth and glossy purple. The tree is a good one, medium in size, compact, when young broadly conical, deep green with the new growth clear light yellow. While it is hardy and pro-

ductive it has not in all places grown and produced as well as some of the other Mexican varieties.

The type of tree which will be desired perhaps most of all is the tall narrow one needing little space. The ideal variety for this purpose is the "Lyon". Beautiful specimens may be seen in the town of Whittier and in other favored spots. Narrow almost as an Italian cypress, dense, deep green, it is a striking object. It is also precocious and productive with large excellent summer fruits. Seeing some particularly handsome trees of this in a yard in Whittier I called on the owner and he told me that at six years from the bud he had picked from one tree 100 fruits which weighed just about 100 pounds. I was so occupied with the beauty of the specimens that I forgot to ask if they also brought him one hundred dollars—perhaps they did. The "Lyon", however, has not prospered in all places, many have overborne and died, others have failed without evident reason. The "Anaheim" has a growth habit similar to the "Lyon", also producing large summer fruits, and is believed to be more reliable. These tall slender forms should be supported by a strong stake since with their heavy foliage and fruit and brittle wood one is occasionally broken.

The suggestions as to varieties are made with much hesitation. Probably no experienced avocado enthusiast would entirely agree with me. There are many other varieties and I have perhaps missed the best for home planting. The avocado growers association is giving much attention to this matter. Only recently Dr. J. Eliot Coit has discovered a tree near Oroville which promises particularly well in cold situations and introduced it under the name "Duke".

The modern nurseries send out their avocado trees with a ball of earth attached. When one has paid perhaps \$5.00 for a good tree and a similar amount for transportation it is of interest not to lose it. Instructions should be carefully followed. As with a child the tree should not be lifted by the neck, but both hands should be used and the ball should be lifted carefully. The wrapping should not be removed. When the tree is set and most of the earth filled and settled the wrapping may be loosened about the stem, turned back and covered with soil.

For those who do not wish to pay for a nursery tree, seedlings may be grown. A "Fuerte" or some of the small fruits should be chosen. Seeds from southern Florida or the lowlands of tropical countries will usually be of the West Indian type which is tender to frost and has not grown well in California. Hold the seed with the broad end down at the top of a glass or bottle and insert several tooth picks to support it in place. Then add water until the base of the seed is wet and keep in a warm room until the little plant begins to grow. When frost danger is past plant it where you wish it to grow and treat it as you would a hill of corn. Shelter should be given from frost for the first two winters. Both the habit and fruit character will be unknown but if the tree shows no sign of blossoming after several years select a sturdy limb and girdle it

near the base by removing a strip of bark one-eighth inch broad and to the wood. If girdled in early summer blossom buds may appear the next spring on the treated limb. If the tree fails to respond it may be grafted over to a fruitful variety. This operation is not as easy as with a deciduous tree but with care should succeed.

Seedlings are particularly adapted to the amateur and to home planting. All are interesting and there is always the chance to get a better variety than any yet known. If, for instance, a seedling of "Fuerte" should be secured with fruit like its parent and maturing at a different season, or more precocious and reliable in bearing, it would be of immense value to the industry.

The avocado fans (if I may use the term) expatiate upon the high food value of the fruit because of its oil content, yet it is probably true that in nearly every home considerable quantities of wholesome fat are thrown away regularly. I believe that it is also true that in every country where the avocado is known it is as highly and universally prized as the sweet orange. There will be little objection if we say the orange is the best refreshing fruit. Then let us leave the explanation for the charm of this peculiar fruit to those deep students of human nature, the psychologists, or to the nutritionists, or to anybody else who may assail the problem; and, if we want to, let us plant an avocado in the front yard—or two of them—or in the back yard or both. Like all human undertakings our project will not want for troubles, but so far as I know, the avocado has not yet suffered seriously from powdery mildew or aphids (thought occasionally there is some spotting by thrips), it has been free from brown rot, codling worms and pear blight, and it has not been a tempter to the robin nor to the small boy.

Citrus Experiment Station, Riverside.

A NEW CASTILLEJA FROM COLORADO.

LEON KELSO

Castilleja flavoviridis sp. nov. Stems one to several, 7-12 cm. high, purplish, glabrate below to tomentose in the inflorescence: leaves narrowly lanceolate, entire or the uppermost sometimes with one or two teeth, 1-3 cm. long, 2-4 mm. wide, the lower glabrate, the upper puberulent: bracts green, 3-parted to the middle or lower; the lateral lobes narrowly lanceolate to setaceous, divaricate, curved, the middle longer and broader, long-acuminate, with a few teeth in the uppermost bracts; as long as or shorter than the calyx, not concealing the flowers, finely villous to floccose: calyx green or somewhat yellowish, short-villous to tomentose, cleft nearly to the middle or less, about 2 mm. lower on the lower side, the lobes cleft 1-3 mm. into acute teeth; corolla 18-25 mm. long; tube yellowish, equaling or much surpassing the calyx; galea yellowish, 4-6 mm. long, pubescent on the back; lip dark green, 3-4 mm. long, its 3 ovate and acute lobes distinctly yellow, 1 mm. long; anthers 2 mm. long.

This plant is nearest related to *C. puberula* Rydberg, from which it differs chiefly in its entire leaves, 3-parted bracts and tomentum in

the inflorescence. Two specimens collected Aug. 6, 1927 on the eastern slope of Bighorn Mountain in the Rocky Mountain National Park, Colorado, alt. 11,300 ft., are in the Rocky Mountain Herbarium at the University of Wyoming. Eight type specimens collected July 28, 1928 on the south slope of Hague's Peak, not far from the former locality, at an altitude from 10,500 to 12,500 ft., are in my collection.
Aurora, Colorado, Feb. 16, 1929.

SEQUOIA SEMPERVIRENS IN GRANADA.

In the lovely gardens of Generalife in Granada the guide called my attention to its crowning glory, this "ancient cedar", as he named it. Roughly speaking the tree is about 125 feet in height, and perhaps four in diameter, and already it towers above the others on the hillside. It is a landmark on the skyline, as one looks across the ravine from the Alhambra, or views it from the heights of St. Nicholas. I thought you might enjoy a leaf, and so I culled one for you.

I know nothing of its history, but the guide book speaks of trees planted by the Duke of Wellington.—HARRIET N. DIMOND, Seville, Spain, in 1926.

It was perhaps shortly after my return from Palestine and Syria that your letter came from Spain, enclosing a spray of our Redwood, *Sequoia sempervirens*, from a tree in Granada. Your letter and the facts which it contains have been the subject of much pondering in my mind. A tree 125 feet high and 4 feet in diameter might possibly be about 120 years old. If so, how did Redwood seed get to Spain in that early day? That would be even before the Redwood was first published botanically in 1824 by Lambert in England. Lambert's specimens were collected by Menzies, surgeon of the Vancouver expedition.

It has always been a thought with me that the Redwood must have been first collected (botanically speaking) by Thaddeus Haenke of the Malaspina Expedition, a scientific adventure originated by Carlos III of Spain. This round the world expedition touched at Monterey in 1791 and Haenke botanized there in the dry season (September). Haenke's California material was published, after long delay, by C. B. Presl of Prague in the *Reliquiae Haenkeanae*, but no mention is made of any Redwood under any name, or of any conifer that could be construed as our species. A copy of Presl's *conifer folio* is in my library, but I do not possess his *Epimelieae Botanicae*, which lists some of Haenke's things and was published as late as 1849. But the last time I was at Kew I found on page 237 of the *Epimelieae* a record showing that Haenke collected the Redwood while in California. In all probability he collected seed as well as herbarium specimens. Since this was a Spanish expedition seed may have gotten back to Spain. Some of the ship's officers, it is known, collected seed of our native trees.—W. L. JEPSON.

MADROÑO

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The purpose of this Journal is, primarily, to publish articles and notes on the botany of the native plants of California; to furnish a medium of communication relating to measures in behalf of the preservation of the native flora; and to provide a record of the Society's meetings and activities. Notes upon the habits, life history or geographical distribution of the native plants will be especially welcome.

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THE FLORA OF THE SANTA ANA CAÑON REGION

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The following report on the flora of the Santa Ana Cañon region has been prepared as a contribution to our knowledge of the botany of a small area in southern California and as a record of the plant communities found there. It was written after a detailed field study of the region had been made, a study extending over a period of about two years while the writer was resident botanist at the Rancho Santa Ana Botanic Garden.* Because of the location of the cañon between the arid interior and the relatively humid coastal region, an interesting variety of species is found assembled together, some of which probably grow together in no other locality. To better understand the climatic and edaphic influences affecting vegetation in the cañon a short account of the geology and climate is given. The determination of most of the plant names occurring in the lists of this report is based on specimens in the herbarium of the writer. "A Manual of the Flowering Plants of California" by W. L. Jepson has been used in determining the names of most of the plants in this report.

LOCATION. The Santa Ana Cañon is situated in southern California in Orange and Riverside counties at an altitude of about 500 ft. It is approximately 12 miles long and $\frac{1}{4}$ to $1\frac{1}{2}$ miles wide, and extends in nearly an east-west direction. The south-east end of the Puente Hills forms the northern wall of the cañon and the northern end of the Santa Ana Mountains forms the southern wall. The Santa Ana River, which with its tributaries drains the large interior basin extending from the eastern end of the San Gabriel Mountains to the San Gorgonio Pass and Temescal Cañon, flows through the Santa Ana Cañon before reaching the Santa Ana coastal plain west of the Santa Ana Mountains. It is unfortunate that the rugged mountain cañon traversed by the Santa Ana River in the San Bernardino Mountains in the upper reaches of its course is also designated the Santa Ana Cañon. The two cañons are not to be confused for they are entirely unrelated geologically as well as physiologically, and geographically they are separated by the broad valley lands and alluvial slopes of the San Bernardino Valley.

GEOLOGY. Two major faults of southern California occur in the Santa Ana Cañon region and are responsible in part for its

*The Rancho Santa Ana Botanic Garden consists of two hundred acres lying on the summit of the hills, north side of the Santa Ana River Cañon near its mouth. The garden has been recently founded by Mrs. Susanna Bixby Bryant who plans to make it a garden of native Californian plants, at least of all species susceptible of being grown here. An irrigation system has been installed and a large administration building completed. The herbarium contains nearly two thousand mounted specimens. At the same time Mrs. Bryant is building up a valuable botanical library having to do with the flora of western America.—W. L. JEPSON.

existence: the Whittier fault which extends along the south-west side of the Puente Hills and through the Santa Ana Cañon to the north-east end of the Santa Ana Mountains, and the Chino-Elsinore fault which extends along the east side of the Puente Hills and the Santa Ana Mountains. During the wide-spread orogenic disturbance which occurred near the close of the Tertiary Period of geologic time the Puente Hills and Santa Ana Mountains were uplifted along these two fault lines. This uplift occurred simultaneously with the upbuilding of the San Gabriel, San Bernardino, and San Jacinto ranges and with the last major uplift of the Sierra Nevada Mountains.¹ During this time of uplift the Santa Ana River maintained its course to the west and degraded the rising barrier. Thus the "Santa Ana Cañon is the valley of an antecedant river", a river which held its course during the upbuilding of a mountain range across its path.²

The petrography of the region in relation to the location of the Santa Ana Cañon and to the present topographic features of the region is significant. All rocks found in the Puente Hills in the vicinity of the cañon are of sedimentary origin and vary from finely bedded shales to coarse sandstone and conglomerate. Weathering in this section has produced a region of rounded hills with frequent outcrops of resistant strata and occasional rocky bluffs. The mountainous and rugged topography of the northern end of the Santa Ana Mountains at the eastern end of the cañon is in striking contrast to the hills of the northern side. Here the heart of the mountain mass is of hard metamorphic and granitic rocks, resistant to rapid erosion. To the west of the summit ridge sedimentary rocks overlay the igneous rocks and this foothill area resembles in rock types and in physiographic features the hills on the north side of the cañon. It is of interest that the Santa Ana River maintained its course as an antecedant stream at the north end of the granitic core of the Santa Ana Mountains and cut its cañon in rocks relatively less resistant.

CLIMATE. The climate of the Santa Ana Cañon region is that of interior coastal southern California characterized by a hot summer season of drought that is tempered in the cañon by fogs and relatively humid westerly winds, and a cooler winter season of rainfall that is accompanied at intervals by warm and drying easterly winds often of gale force, locally called Santa Anas. No rainfall or temperature data are obtainable for the cañon but such data from Anaheim near the western entrance of the cañon are available. The average annual rainfall at Anaheim is 11.5 inches and the average annual temperature is 64.3°F. The rainfall in the cañon is reported locally to average about 12 inches annually but on the higher slopes of the Santa Ana Mountains it is very much more,

¹ Walter A. English, *Geology and Oil Resources of the Puente Hills Region, Southern California*, U. S. Geol. Sur. Bull. 768: 48 (1926).

² Loc. cit., p. 65.

and is accompanied by some snowfall, generally above 3000 feet. The temperature of the cañon is somewhat higher than that of the coastal plain in the summer, and in the winter it is higher because of the warm "Santa Anas".

The climate of the Santa Ana Cañon region is shown on Russell's map in his recent classification of the climates of California³ as a uniform warm-humid type with hot, dry summers (the hot summer type of the Mediterranean climate or "Olive Climate") placed between two areas of the hot-dry-steppe type, the one area coastal, the other inland. However the two climates are both well developed and differentiated in the cañon although the area occupied by the latter type is scarcely sufficient to be mapped. Extending from the San Bernardino Valley of the hot-dry-steppe type to the same type on the Santa Ana coastal plain there is a distinct belt characterized by this climatic type on the southern, cañon-side slopes of the Puente Hills. Physiologically this has had a marked effect for on these hills there is no development of chaparral, the brush formation being the *Salvia-Artemisia* Association⁴, a more arid type than the true chaparral. Characteristic of these slopes also are plants of the arid interior valleys and desert which are rare or absent from the chaparral and cañons of the northern Santa Ana Mountains and the central and northern Puente Hills. This effect of exposure is of the same character as that pointed out by Hall⁵ and Jepson⁶ in connection with irregularities of life zones.

Furthermore the steppe climate in the Santa Ana Cañon marks a transitional stage from the coastal steppe climate to the interior steppe climate, the two climatic regions being locally very distinct in the amount and duration of foggy weather and in the matter of relative humidity and temperature. And as will be shown in the following discussion, the vegetation of the cañon region is characterized to a marked degree as a transition from the coastal flora to the interior flora, reflecting in a vegetative way the climatic transition. In summary: in the region of the Santa Ana Cañon there are two climatic types: one, the hot-dry-steppe type determined by 9.5 to 14 inches of annual rainfall with an average annual temperature of 55°F. or more; and two, the hot-dry-summer type of Mediterranean climate determined by an annual rainfall of over 14 inches with an average annual temperature of 55°F. and with the average temperature for the warmest month above 71°F.

LIFE ZONES AND PLANT FORMATIONS. The flora of the Santa Ana Cañon region is nearly confined to the Upper Sonoran Zone.⁷ At

³ R. J. Russell, *Climates of California*, Univ. Calif. Publ. Geogr. 2: (1926).

⁴ F. E. Clements, *Plant Indicators*, Carnegie Inst. Publ. 290: 160 (1920).

⁵ H. M. Hall, *Botanical Survey of San Jacinto Mountain*, Univ. Calif. Publ. Bot. 1: 34 (1902).

⁶ W. L. Jepson, *A Manual of the Flowering Plants of California*, 9 (1925).

⁷ C. H. Merriam, *Life Zones and Crop Zones in the United States*, Bull. U. S. Biol. Survey (1898).

the northern end of the Santa Ana Mountains the lower Transition Zone is suggested in the deep cañons where *Pseudotsuga macrocarpa*, *Umbellularia californica*, and *Acer macrophyllum* are found and further south on the higher peaks of the range where an open growth of *Pinus coulteri* occurs in the chaparral and *Pseudotsuga macrocarpa* is found on slopes and in the cañons. The grassland covering the clay flats and more gently rolling hills of the western slope of the Santa Ana Mountains and of the Puente Hills probably represents Lower Sonoran. However the grassland areas are limited in extent and on nearly all the steeper slopes the woody plants of the lower part of the Upper Sonoran are becoming established—*Eriogonum fasciculatum* var. *foliolosum*, *Ericameria palmeri*, *Gutierrezia sarothrae*, and *Artemisia californica*. All the rest of the region lies within the Upper Sonoran Zone. Due to the variations of soil, moisture and topography in this zone several marked and easily defined plant communities have developed.

To understand better these various plant communities and their interrelationships and to appreciate more fully the types of habitat in which plants of the region occur, it has seemed best to describe the plant communities after the manner of field ecologists taking into consideration such topographic, edaphic, and climatic features that appear important. For these purposes the classification of plant communities given by Clements in his work "Plant Indicators"⁸ is used here as a basis for discussion. According to this classification the following plant associations are found in the region of the Santa Ana Cañon:

- A. *Stipa*-*Bouteloua* Formation or Grassland Climax.
 - 1. *Agropyron*-*Stipa* Association or Bunch-grass Prairie (weak development).
- B. *Atriplex*-*Artemisia* Formation or Sagebrush Climax.
 - 1. *Salvia*-*Artemisia* Association or Coastal Sagebrush.
- C. *Quercus*-*Ceanothus* Formation or Chaparral Climax.
 - 1. *Adenostoma*-*Ceanothus* Association or Coastal Chaparral.
- D. *Pinus*-*Pseudotsuga* Formation or Montane Forest Climax.
 - 1. *Pinus* Association or Sierra Montane Forest (very weak development).

Since the flora of the ponds, marshes, and flats of the Santa Ana River bottom is not included in the above divisions, it is described as a separate formation.

GRASSLAND FORMATION. As stated above the grassland as a plant formation is of very limited extent and is confined to flats and gently sloping hillsides that have a deep surface layer of clayey soil. The grasses of these areas are largely introduced annual species including *Bromus rubens*, *Lamarckia aurea*, *Hordeum murinum*, and *Avena barbata*, the characteristic perennial grasses being *Stipa lepida* and *Stipa pulchra*, both natives. Numerous species of herbaceous plants,

⁸ F. E. Clements, *Plant Indicators*, Carnegie Inst. Publ. no. 290 (1920).

annual and perennial, other than grasses are characteristic of the grassy areas and form definite societies at different seasons. Among the spring flowers are *Calochortus catalinae*, *Ranunculus californicus*, *Lepidium nitidum*, *Lupinus succulentus*, *Amsinckia douglasiana*, *Orthocarpus purpurascens*, *Uropappus lindleyi*, and *Layia platyglossa*. At this time too in favorable years large areas of hillside are covered with *Brassica nigra*. In May and June a late vernal society develops that includes such types as *Lotus salsuginosus* var. *brevivexillus*, *Lotus hamatus*, *Godetia quadrivulnera*, *Centaurium venustum*, *Linanthus pharnaceoides*, *Mimulus brevipes*, and *Hemizonia fasciculata*, and during the summer *Cucurbita foetidissima*, *Asclepias eriocarpa*, and *Grindelia camporum* var. are characteristic perennial herbs. In late summer and fall a society made up mainly of perennial suffrutescent plants develops and while it reaches a higher development on sandy slopes and rocky hillsides numerous individuals are found in the grassland especially where it borders the sagebrush formation. The commonest perennial species of this group are *Eriogonum elongatum*, *Gutierrezia sarothrae*, *Ericameria palmeri*, *Isocoma veneta* var. *vernonioides*, *Corethrogyne filaginifolia* var. *rigida*, and *Artemisia californica*, and the tall annuals or biennials, *Stephanomeria virgata* and *Malacothrix altissima* are conspicuous on flats and road-cuts in clay soil.

SAGEBRUSH FORMATION. The sagebrush formation has a high development in the hills on either side of the Santa Ana Cañon where it occurs on sandy washes and eroding surfaces and on rocky slopes and hillsides where the residual soil is shallow or lacking. In the southern Puente Hills it is the only well developed brush formation while in the Santa Ana Mountains it is either weakly developed along the lower edges of the chaparral, or in favorable locations is well developed as a broad belt between the grassland of the lower foothills and the chaparral. This sagebrush formation is the "foot-hill formation" according to McKenney⁹ as contrasted with his "mountain formation" or chaparral. According to Abrams¹⁰ it is the lowest belt of the chaparral, a belt intermediate between the Upper and Lower Sonoran Zones. Clements¹¹ treats the whole coastal sagebrush as a single climax formation, sometimes represented in certain areas by a pure society composed of either *Eriogonum fasciculatum* var. *foliolosum*, *Salvia mellifera*, *Salvia leucophylla*, *Salvia apiana*, or *Artemisia californica*. Cooper¹² indicates that there are probably two aspects of the coastal sagebrush climax of Clements—one, "undoubtedly climax in certain portions of the interior valleys" of south-

⁹R. E. B. McKenney, Notes on Plant Distribution in Southern California, Beih. zum Bot. Cent. 10: 168 (1901).

¹⁰LeRoy Abrams, A Phytogeographic and Taxonomic Study of the Southern Californian Trees and Shrubs, Bull. N. Y. Bot. Gard. 6: 316 (1910).

¹¹F. E. Clements, Plant Indicators, p. 160.

¹²W. S. Cooper, The Broad Sclerophyll of California, Carnegie Inst. Publ. no. 319: 82 (1922).

ern California, and two, successional, leading to a true chaparral climax. Under the successional sagebrush, Cooper describes the *primary* sagebrush succession¹³ as having marked and characteristic development on alluvial fans and erosional slopes, and the *secondary* sagebrush succession¹⁴ as having definite development within a chaparral area following fire. In the Santa Ana Cañon region only the primary sagebrush succession was observed.

Cooper's idea of the dual nature of the *Atriplex-Artemisia* Association of Clements agrees with observations made in the Santa Ana Cañon region. There extensive areas of matured physiographic character are uniformly planted with *Salvia mellifera*, *Salvia leucophylla*, and *Artemisia californica* and such plantings have the characteristics of a true climax brush formation and in the same region *Eriogonum fasciculatum* var. *foliolosum*, *Salvia mellifera*, *Salvia apiana*, and *Artemisia californica* inhabit in irregular plantings the rocky slopes of recently eroded sedimentary deposits and the surfaces of recent alluvial washes, representing the primary successional sagebrush spoken of by Cooper. The two types of sagebrush vegetation are very distinctive in appearance and when studied in connection with the physiographic ages of the two habitats where they occur, the two types can scarcely be confused.

Cooper's theory that the primary sagebrush succession leads to a chaparral climax is substantiated by the flora found on the bluffs of the Puente Hills near the eastern end of the Santa Ana Cañon. Here plants characteristic of the primary successional sagebrush flora grow with *Adenostoma fasciculatum* and other species usually associated with the chaparral. This group of plants constitutes the nearest approach to true chaparral in the southern Puente Hills and is of particular interest when considered in relation to the chaparral which has such a high development on the slopes of Sierra Peak just across the cañon about one-fourth mile distant. In this transitional area of sagebrush to chaparral the following plants are growing: *Eriogonum fasciculatum* var. *foliolosum*, *Adenostoma fasciculatum*, *Photinia arbutifolia*, *Lotus scoparius*, *Stillingia linearifolia*, *Rhus laurina*, *Rhus integrifolia*, *Rhus ovata*, *Rhamnus crocea* var. *ilicifolia*, *Sphaeralcea fasciculata* var. *laxiflora*, *Helianthemum scoparium* var. *vulgare*, *Leptodactylon californicum*, *Salvia mellifera*, *Gutierrezia sarothrae*, and *Encelia californica*.

The plants of the sagebrush formation can be easily divided between two communities—the one inhabiting the exposed, hot southern slopes, the other inhabiting the shaded northern slopes and cañon-sides. The plants are generally not confined to one habitat but are often better developed in one than in the other, and in the following lists the plants are named as characteristic of that habitat in which they are more numerous and more fully developed. Characteristic shrubby or suffrutescent plants of the southern slopes are *Eriogonum*

¹³ Loc. cit., p. 82.

¹⁴ Loc. cit., p. 86

fasciculatum var. foliolosum, *Astragalus leucopsis*, *Rhus laurina*, *Sphaeralcea fasciculata* var. *laxiflora*, *Opuntia occidentalis*, *Opuntia vaseyi*, form related to *Opuntia parryi*, *Salvia mellifera*, *Salvia leucophylla*, *Salvia apiana*, *Castilleja foliolosa*, *Galium angustifolium*, *Gnaphalium beneolens*, *Artemisia californica*, and a distinctive fall flora consisting of *Eriogonum elongatum*, *Brickellia californica*, *Gutierrezia sarothrae*, *Ericameria palmeri*, *Ericameria pinifolia*, *Isocoma veneta* var. *vernonioides*, *Hazardia squarrosa*, *Chrysopsis villosa* var. *fastigiata*, *Corethrogyne filaginifolia* var. *rigida*, *Artemisia dracunculus*. *Nicotiana glauca* is conspicuous on slopes where surface soil has been disturbed. Among the annual and perennial herbs of these southern slopes are *Selaginella bigelovii*, *Melica imperfecta*, *Muhlenbergia microsperma*, *Aristida bromioides*, *Stipa coronata*, *Andropogon saccharoides*, *Sitanion jubatum*, *Brodiaea capitata*, *Calochortus splendens*, *Calochortus weedii* var., *Chorizanthe staticoides*, *Eriogonum gracile*, *Mirabilis laevis*, *Cotyledon laxa*, *Lupinus sparsiflorus*, *Oxalis wrightii*, *Euphorbia polycarpa*, *Eulobus californicus*, *Hugelia virgata*, *Gilia multicaulis*, *Emmenanthe penduliflora*, *Salvia columbariae*, *Cryptanthe flaccida*, *Plantago erecta*, *Chaenactis glabriuscula*, *Chaenactis artemisiaefolia*, *Baeria aristata*, *Senecio californicus*. On the northern slopes and cañon-sides the commonest shrubs and woody-based plants are *Quercus dumosa* var. *elegantula*, *Ribes malvaefolia*, *Ribes speciosum*, *Photinia arbutifolia*, *Polygala cornuta* var. *fishiae*, *Rhus diversiloba*, *Rhus integrifolia*, *Rhus ovata*, *Rhamnus crocea* var. *ilicifolia*, *Solanum douglasii*, *Solanum xantii*, *Pentstemon cordifolius*, *Pentstemon antirrhinoides*, *Diplacus longiflorus*, *Lonicera subspicata*, *Eriophyllum confertiflorum*. Herbs found among these shrubs on shaded cañon-sides are *Pterostegia drymarioides*, *Montia perfoliata*, *Paeonia brownii*, *Thysanocarpus laciniatus*, *Godetia bottae*, *Osmorrhiza brachypoda*, *Bowlesia lobata*, *Nemophila aurita*, *Phacelia hispida*, *Galium nuttallii*, *Rafinesquia californica*. Trees frequently found in the cañons of the sagebrush formation are *Quercus agrifolia*, *Juglans californica*, and *Platanus racemosa*. On sandy washes of the larger cañons *Lepidospartum squamatum* is a characteristic shrub while in more stable situations of the drier cañon bottoms *Yucca whipplei*, *Nolina parryi*, *Delphinium cardinale*, *Romneya coulteri*, *Fraxinus dipetala*, *Philibertia heterophylla*, *Senecio douglasii*, and *Tetradymia comosa* grow in open formation with mingled trees and shrubs from the sagebrush and the chaparral.

CHAPARRAL FORMATION. The coastal chaparral¹⁵ is well developed on the higher and rockier slopes of the northern end of the Santa Ana Mountains in the vicinity of the Santa Ana Cañon and over most of the slopes of Sierra Peak it forms a dense and uniform covering. The formation is practically absent from the Puente Hills on the northern side of the cañon and almost without doubt it is un-

¹⁵ F. E. Clements, loc. cit., p. 190.

favorable climatic factors that retard or inhibit the development of chaparral there. "Of direct and fundamental importance is soil moisture"¹⁶ and it is probable that sufficient moisture is not present in the southern slopes of the Puente Hills during the winter growing period to allow chaparral species to thrive. In the preliminary discussion on the climate of the Santa Ana Cañon region it was pointed out that there is a hotter, drier type of climate in the southern Puente Hills than in the northern Santa Ana Mountains and in relation to the distribution of chaparral in this region these climatic variations appear to have fundamental significance.

In the northern Santa Ana Mountains there is a distinct mingling of plants of the sagebrush formation and the chaparral along the lower edges of the chaparral. The result is a mixed shrub formation in which neither the species of the chaparral nor of the sagebrush are dominant. At one station in Claymine Cañon on the lower slopes of Sierra Peak at the lower edge of the chaparral the following species grow together in close brush formation on a moderately sloping rocky hillside: *Eriogonum fasciculatum* var. *foliolosum*, *Adenostoma fasciculatum*, *Photinia arbutifolia*, *Lotus scoparius*, *Rhus laurina*, *Rhus integrifolia*, *Rhamnus crocea* var. *ilicifolia*, *Ceanothus macrocarpus*, *Leptodactylon californicum*, *Salvia mellifera*, *Salvia apiana*, *Trichostema lanatum*, *Pentstemon antirrhinoides*, *Diplacus longiflorus*, *Galium angustifolium*, *Eriophyllum confertiflorum*, and *Artemisia californica*. *Nolina parryi*, *Yucca whipplei*, *Romneya coulteri*, *Prunus ilicifolia*, *Rhus ovata*, and *Helianthus gracilentus* are also commonly present in such mixed brush formations. This mixed chaparral and sagebrush is found along the lower edges of the chaparral where it sometimes forms a broad belt and it is the characteristic type of vegetation in deep narrow cañons that extend far up into the chaparral of the higher slopes.

The most abundant members of the true chaparral are *Adenostoma fasciculatum*, *Ceanothus tomentosus* var. *olivaceus*, *Ceanothus macrocarpus*, *Ceanothus crassifolius*, *Arctostaphylos glauca*, *Arctostaphylos glandulosa*. As has been pointed out by Abrams¹⁷ *Adenostoma fasciculatum* dominates the lower part of the chaparral and the species of *Ceanothus* and *Arctostaphylos* prevail at higher altitudes. Other plants more or less numerous in the chaparral of the northern Santa Ana Mountains are *Yucca whipplei*, *Nolina parryi*, *Dendromecon rigida*, *Cercocarpus betuloides*, *Pickeringia montana*, *Rhamnus californica*, *Leptodactylon californicum*, *Eriodictyon crassifolium*, *Trichostema lanatum*, *Sphacele calycina* var. *glabella*. *Cupressus forbesii*, here at the northern limit of its range, forms interesting colonies in the chaparral generally as shrubby densely branched trees less than 30 feet high.

RIVER-BOTTOM FLORA. The narrow floor of the Santa Ana Cañon

¹⁶ W. S. Cooper, loc. cit., p. 63.

¹⁷ L. Abrams, loc. cit., p. 316

is a nearly level area bounded by the cañon walls. In parts the whole of the cañon floor is occupied by the sandy flood-plain and broad bottom lands of the Santa Ana River, in other parts above the river-bottom there are broad arable fields that slope down from the cañon walls. Although during the irrigating season nearly all the water is taken from the river near the eastern end of the cañon, water is found in the river-bed some distance below the canal intake and water is found at all times in numerous ponds and marshes of the river-bottom. All types of habitat from truly aquatic to paludose and moist riparian are to be found, accommodating a varied flora. At a few points alluvial fans extend into the cañon from the north or south and here and there in the broad river-bottom are bar-like ridges or "islands" five to ten feet above the river level. These fans and "islands" due to their height above the river level and their sandy rocky character are much drier than any other part of the river-bottom and are related floristically to the arid hills covered by plants of the sagebrush formation. On the fans and "islands" of the river-bottom grow some of the most interesting plants of the cañon, plants that are native of the interior valleys and that are brought into the cañon at times of flood.

The ponds and marshes of the river-bottom are frequent in the middle and upper parts of the cañon but become rarer to the west where, during the summer, the river is marked only by the sandy expanse of the broad dry bed. Submerged aquatics of the ponds include *Potamogeton crispus*, *Zannichellia palustris*, *Lemna trisulca*, and *Myriophyllum spicatum* and the floating flora is composed of such widely distributed species as *Azolla filiculoides*, *Lemna minor*, and *Wolffiella lingulata*. In the shallow water of the marshes are found *Typha angustifolia*, *Cyperus melanostachyus*, *Eleocharis rostellata*, *Scirpus validus*, *Scirpus americanus*, *Polygonum hydropiperoides*, *Radicula nasturtium-aquaticum*, *Jussiaea californica*, *Oenanthe sarmentosa*, *Samolus floribundus*, *Lycopus americanus*, *Bidens levis*, and *Helenium puberulum*. A large number of sedges and rushes are found on the moist flats of the river-bottom, among which are: *Cyperus laevigatus*, *Cyperus esculentus*, *Eleocharis capitata*, *Eleocharis acicularis*, *Eleocharis montana*, *Scirpus cernuus*, *Carex praegracilis*, *Juncus balticus*, *Juncus bufonius*, *Juncus torreyi*, *Juncus rugulosus*, and *Juncus xiphioides*. Other plants growing on the moist flats with the sedges and rushes are: *Equisetum funstonii*, *Distichlis spicata*, *Sporobolus asperifolius*, *Sporobolus airoides*, *Cynodon dactylon*, *Paspalum distichum*, *Cenchrus pauciflorus*, *Ane-mopsis californica*, *Ranunculus cymbalaria*, *Psoralea orbicularis*, *Psoralea macrostachya*, *Lythrum californicum*, *Epilobium californicum*, *Hydrocotyle ranunculoides*, *Hydrocotyle umbellata*, *Hydrocotyle verticillata*, *Eustoma silenifolium*, *Lippia lanceolata*, *Petunia parviflora*, *Mimulus cardinalis*, *Plantago hirtella*, *Solidago occidentalis*, *Aster exilis*, *Baccharis emoryi*, *Baccharis viminea*, *Pluchea camphorata*, *Artemisia vulgaris* var. *heterophylla*. On the sandy flats and "islands" of the river-bottom grow four species of willow, *Salix laevigata*,

Salix nigra var. *vallicola*, *Salix argophylla*, and *Salix lasiolepis*, besides *Populus fremontii*, *Populus trichocarpa*, *Alnus rhombifolia*, and *Platanus racemosa*.

The "islands" of the river-bottom have already been described, and the fact that the character of the vegetation is that of the sagebrush formation of the hillsides has been mentioned. Many of the plants found on the "islands" are of the same species as those found in the sagebrush but many are not and appear to be plants brought into the cañon during floods. *Eriogonum thurberi*, *Amorpha fruticosa*, *Stillingia linearifolia*, *Hugelia densifolia* var. *sanctorum*, *Eriodictyon trichocalyx*, *Eriodictyon crassifolium*, *Pluchea sericea*, *Artemisia tridentata*, and *Artemisia dracunculus* (a form distinctly different from that of the hillsides) appear to be of this type, most of these species being found in the interior valleys and mountains. Even several specimens of *Cupressus forbesii* are to be found in the river-bottom. Other plants of the drier parts of the river-bottom are *Clematis ligusticifolia*, *Rosa californica*, *Croton californicus*, *Vitis girdiana*, and *Senecio douglasii*, and such annual species as *Loeflingia squarrosa*, *Lepidium lasiocarpum*, *Tillaea erecta* of the spring and *Heterotheca grandiflora*, *Ambrosia psilostachya*, and *Franseria acanthicarpa* of the fall.

THE SANTA ANA CAÑON FLORA. In his treatment of the Upper Sonoran Zone in southern California Abrams recognizes three sub-districts¹⁸—Littoral, the seashore belt; Coastal, the fog belt; and Interior, the chaparral belt. The flora of the Santa Ana Cañon region marks the transition from the flora of the Coastal Sub-district to that of the Interior Sub-district and growing together in the cañon are plants representative of either the one or the other of the sub-districts. Out of twenty-two species which Abrams considers typical of the Coastal Sub-district eight are found in the Santa Ana Cañon region, out of twelve species listed for the Interior Sub-district four are represented or common in the cañon region, and out of fourteen species of the "Lower Sonoran of the interior valleys"¹⁹ four species occur in the Santa Ana Cañon. These species are: *Juglans californica*, *Ribes speciosum*, *Lupinus longifolius*, *Polygala cornuta* var. *fishiae*, *Rhus laurina*, *Ceanothus macrocarpus*, *Trichostema lanatum*, *Salvia leucophylla* from the Coastal Sub-district; *Pseudotsuga macrocarpa*, *Pickeringia montana*, *Ceanothus crassifolius*, and *Pentstemon antirrhinoides* from the Interior Sub-district; *Ericameria pinifolia*, *Bebbia juncea*, *Lepidospartum squamatum*, and *Tetradymia comosa* from the interior Lower Sonoran valleys. *Salix nigra* var. *vallicola*, *Salix argophylla*, *Atriplex canescens*, *Baccharis emoryi*, *Pluchea sericea*, and *Lepidospartum squamatum*, all of which are well represented in the cañon, are given by Abrams as characteristic trees and shrubs of the Lower Sonoran Zone of the Mojave Desert. Other plants

¹⁸ L. Abrams, loc. cit., p. 314.

¹⁹ Loc. cit., p. 319.

found in the cañon that are characteristic of these several areas named by Abrams are: *Dicentra ochroleuca*, *Hasseanthus variegatum* var. *elongatum*, *Rhus integrifolia*, *Nemophila aurita*, *Ellisia chrysanthemifolia*, and *Encelia californica* from the coast; *Jepsonia parryi*, *Rhus ovata*, *Hugelia densifolia* var. *sanctorum*, *Porophyllum gracile*, and *Artemisia tridentata* from the interior. Of these latter, *Dicentra ochroleuca* which is found near the top of Sierra Peak in the chaparral and *Porophyllum gracile* which is locally common on a rocky hog-back ridge in the sagebrush have not been reported from the Santa Ana Cañon region and represent extensions of range—the first from Santa Monica Mountains southward, the second from the Riverside district westward.

JOHANN FRIEDERICH ESCHSCHOLTZ

WILLIS LINN JEPSON

On Oct. 2, 1815, the exploring ship *Rurik* entered San Francisco Bay. It had been fitted out by the Russian chancellor, Count Rumiantzof, to undertake a round the world voyage of discovery under the command of Lieutenant Otto von Kotzebue of the Russian Imperial Navy. Two naturalists accompanied the voyage, Adelbert von Chamisso and Dr. J. F. Eschscholtz, the latter being the surgeon of the expedition. These two botanized on the San Francisco peninsula during the month of October, after which the *Rurik* sailed for the Sandwich Islands on November 1.

Among the new plants collected at San Francisco was a poppy-like species which Chamisso, after his return home, dedicated to his companion as a new genus, *Eschscholtzia*, and thus made well-known to all future Californians the name of the surgeon of the *Rurik*. Probably the first paper devoted exclusively, save for a few post-scriptal notes, to Californian plants and carrying California in its title, was written by Eschscholtz. This paper, "Descriptiones Plantarum Novae Californiae," was published in the *Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg* in 1823. For the first time we have here named and described various very common Californian plants: *Abronia latifolia*, *Navarretia* (*Hoitzia*) *squarrosa*, *Polemonium capitatum*, *Solanum umbelliferum*, *Ceanothus thrysiflorus*, *Rhamnus californica* and *Lupinus chamissonis*.

When Kotzebue undertook his second voyage of exploration Dr. Eschscholtz again went out with him. After this Eschscholtz became professor of anatomy in the University of Dorpat. His writings are of importance but they lie mainly in the field of zoology. Born at Dorpat in November, 1753, he died there in May, 1831.

[Otto von Kotzebue, *A voyage of discovery into the South Sea and Bering's Straits*, 1:275-290; 3: 38-51 (London, 1821). Adelbert von Chamisso, *Werke*, ed. 3, 1: 141-155 (1852); *Entdeckungsreise um die welt*, 103-118 (Munich, 1925).]

SERTULUM CALIFORNIENSE.—I.

WILLIS LINN JEPSON

CONCERNING THE IDENTITY OF *ARABIS BOLANDERI* WATS. In the preparation of the Manual of the Flowering Plants of California the object held in view was to prepare a flora resting primarily on studies of living plants or of actual preserved materials and not on published descriptions of species or reputed occurrences of species in California. With such a premise the author did not conceive it to be his duty to find a plant or a specimen for every published species, but it was his duty to determine a name for every plant known to him as constituting a distinct element in any one of the various plant associations throughout the state. Therefore, many published species were omitted and left for future study. One of these omitted species, of which we had no clear view, was *Arabis bolanderi*.

This species was published in 1887 by Sereno Watson in the Proceedings of the American Academy of Arts and Sciences (22: 467). It was evidently based primarily on a collection made by H. N. Bolander in "Yosemite Valley or Mono Pass." Both because of being the first cited specimen in the original diagnosis and because of the specific name, I am taking the Bolander plant as the type. The specimen representing this type has been kindly loaned me by Professor B. L. Robinson of the Gray Herbarium, Harvard University. The label is the usual Geological Survey of California label; it bears in the hand of Asa Gray the annotation "with 6270 or 6273", referring to Bolander's numbers. In the Bolander field book, the locality for the number 6270 is indicated as "Big Trees, Yosemite Valley," which in this case and of that year, 1866, means Clark's Big Trees, Yosemite Valley region, that is to say, the Mariposa Grove. Since no second collection at all similar to this one has to my knowledge ever been made in that region the probabilities are that this specimen was collected further eastward, and that the correct number is 6273 which in the Bolander field book reads "*Arabis*. Mono Pass." Some disposal is given to this view by the fact that an almost identic plant, to be noticed further below, has been collected in the high central region of the Sierra Nevada by H. M. Evans.

The type specimen consists of a single individual; it is a plant 4.8 dm. high, the stem from a triennial root, branching from 4.5 cm. above the root-crown, the branches ascending, slender. The herbage is thinly stellate-puberulent, or glabrous above. The cauline leaves are narrowly or attenuate lanceolate, sessile-auriculate, entire, 1.5 to 2.8 cm. long; the basal leaves probably oblanceolate or obovate and shortly petioled. The flowers are 5 mm. long, the petals about twice as long as the sepals. The racemes have the pods discrete or somewhat scattered and spreading widely or horizontally. The pods are narrowly linear, straight, 1.8 to 3 cm. long, 1 mm. wide (of uniform breadth), glabrous, on pedicels 4 to 6 mm. long.

On the type specimen nearly all the pods appear mature and

many of them have dehisced. All the pods which have dehisced contain only sterile ovules; these ovules have not developed even partially. It is obvious from examination that all the pods are of uniform character and sterile, and apparently owe their peculiar form to sterility.

Confirmation of this view is given by comparing a sheet of plants from Mt. Ralston (H. M. Evans in 1918) which in habit, duration, flowers, racemes, pedicels and fruits resembles very closely the Bolander plant. The fruits are likewise sterile. In particular the pods of one individual of the Evans collection are essentially identical in shape and size and hue with those of the Bolander plant. The septum in the Evans specimen carries a peculiar whitish tissue which may possibly be related to the sterile condition. One is inclined to think that the two collections owe their similarity to the same causes. There is just one qualifying but interesting observation to be made on the Evans collection. One of the racemes bears amongst the sterile pods a single fertile pod, markedly conspicuous by its larger size in contrast to the small sterile pods above and below it. The seeds in this pod are narrowly wing-margined.

On the type sheet of *Arabis bolanderi* Wats., Asa Gray had written *Arabis (Turritis) retrofracta* var. *siliculis parvis*. This annotation must have been before the eye of Watson. It is in any event a penetrating comment which may now be carried a step further. It is my judgment that the Bolander specimen is to be referred to *Arabis retrofracta* as an abnormal form.

Two other specimens are cited by Watson in his original description: "mountains of Washington Territory (Brandegge)" and a Torrey specimen from Colorado. The first I have not seen; the second consists of a single raceme mounted on the type sheet. It is not, I think, conspecific with the Bolander plant.

A NEW OROBANCHE FROM SOUTHERN CALIFORNIA. *Orobanche valida* Jepson n. sp. Stem simple or with supplementary erect branches from the middle, 1.7 to 2.7 dm. high; herbage, bracts and calyces dark brownish purple; stem, bracts and perianth minutely and sparingly more or less glandular-puberulent; spike dense; bracts lanceolate and slenderly attenuate, brownish purple or almost black, prominently exceeding the buds, somewhat shorter than the flower in anthesis; calyx 10 mm. long, cleft nearly to the base into lanceolate lobes slenderly attenuate above the middle, the lobes equal or nearly so, about $\frac{4}{5}$ as long as the corolla; corolla-tube curved outward and markedly constricted at the middle, the limb evidently 2-lipped; upper lip dark purple, its lobes triangular-ovate, acute; lower lip yellow, the lobes ovate, acuminate, with a median dark nerve, the sinuses between the lobes acute; lobes of the upper and lower lip approximately alike in size and shape, the corolla bilabiate being due to position rather than to structure; filaments glabrous, inserted at the constriction in the corolla-tube, slender, not markedly dilated at base, curved at tip, thus holding the anthers horizontally;

anthers glabrous, nearly circular, rounded at apex, with acute basal tips to the cells; style glabrous; stigma flat, circular.

Type locality: South Fork of Rock Creek, San Gabriel Mts., F. W. Peirson, no. 7937, June 2, 1928. Specimens of this species have been sparingly distributed under the name *Orobanche ludoviciana* Nutt. It seems likely, also, that the plant cited as *O. ludoviciana* by Dr. A. Davidson in the Bulletin of the Southern California Academy of Sciences (26:16) as occurring on Mt. Islip in the San Gabriels may be of the same species as the plant of Rock Creek. It is necessary, therefore, to comment upon the Nuttallian species.

Orobanche ludoviciana was collected by Nuttall in the northern Rocky Mountains. The writer has not seen the type but apparently authentic specimens from that region (Otter Creek, Montana, F. W. Anderson; Yellowstone Park) exhibit yellowish brown spikes with yellowish flowers. The lips of the corolla in *O. ludoviciana* are very unlike; the lobes of the lower lip are subulate-lanceolate with broad sinuses between them, the sinuses at apex being, as it were, truncate. The more elongate anthers are held vertically. The stigma is somewhat 2-lobed and larger than in *O. valida*.

It is well, also, to compare *O. valida* with *O. cooperi*; *O. valida* has the bracts about $\frac{1}{2}$ to $\frac{2}{3}$ as long as the calyx-lobes; glabrous anthers; calyx darker than in *O. cooperi*, its lobes equaling the corolla-tube and more attenuate than in *O. cooperi*; the corolla more constricted above ovary than in *O. cooperi* and its lobes sometimes somewhat cuspidate (especially the upper); and the stigma disk-shaped. *O. cooperi* has bracts nearly as long as the corolla-tube; calyx-lobes as long as corolla-tube; anthers with a few long hairs at the upper end; the stigma elliptical, its revolute lobes 2 or it is irregularly and revolutely lobed. In *O. valida* the plant has a dark purple, almost black coloration; in *O. cooperi* the plant is yellow or yellowish.

REDISCOVERY OF *ERIOGONUM DESERTICOLA* WATS. In mid-April, 1927, while on a botanical trip across the plain of the Colorado Desert in eastern Imperial County, the writer in company with Mr. Frank W. Peirson observed a species of *Eriogonum* which appeared to be new to California, a low bush one or two feet high but distinctly woody. The plants were in leafage only, but had a characteristic aspect. It was evident that no such plant had ever been included in any flora or manual of Botany relating to California. At my request Mr. I. T. Weeks, resident in the Imperial Valley, collected during August, 1929, good flowering specimens and it was then obvious that the plant was a described species. One of Watson's new *Eriogonums*, *E. deserticola*, had long been to me something of an enigma in the history of that region. Collected by C. R. Orcutt in 1890 in the southwestern part of the Colorado Desert, published in 1891 (Proc. Am. Acad. 11:125) and described very briefly, the diagnosis carried the indication "apparently an annual". This expression has probably misled others as well as the writer. Flowering branches broken

off the top of the plant do suggest in aspect some of the well-known annual species of this genus. With correlated vegetative and reproductive material before one, it then became apparent that flowering branches had also been collected by Mr. Frank W. Peirson on Nov. 26, 1927, somewhere in the region on the southwest side of the Salton Sea. In the matter of distributional knowledge of this species we are under special obligation to Mr. I. T. Weeks, who has conducted a fairly thorough-going survey of the occurrence of the plant in the eastern Colorado Desert. The careful account of his findings appears in a separate article in this issue of the Society's journal. It is somewhat interesting that no one person, so far as known, has, during the period of seasonal development of the bush, collected all the stages which are necessary for a proper determination of its affinities.

THE VEGETATION OF SILENT CAÑON, COLORADO DESERT. The eleventh of April in 1927 was bitter cold in the eastern San Bernardino Valley. Snow lay heavily on all the heights of the neighboring mountains and extended down into the foothills. So it was that, bound eastward over San Gorgonio Pass, to Mecca, we felt comforted for once by the warmth of the desert. The machine, heavily loaded with botanical supplies and commissary, held two of us, Mr. Frank W. Peirson and myself. After some days of delightful field work in Painted Cañon, which lies in the hills northerly from Mecca, we turned southward along the new highway which approximately parallels the old wagon road to Fish Springs, thinking to turn off it and eventually end up at Seventeen Palms.

In the Colorado Desert, as in other deserts, wagon tracks and trails may become completely obliterated in the winter season by the rushing waters of cloudbursts; at any time of the year and especially in the summer by the loads of sand and debris shifted by winds of gale force or even moderate intensity. Through the latter cause, most likely, we were not able to pick up with certainty the wagon trail to Seventeen Palms, a well-marked locality which lies on the desert's edge at the southeasterly base of the Santa Rosa Mountains. Pondering the matter we followed vehicle tracks which led westerly up the sandy floor of an arroyo. While it soon became plain that this was not the way to Seventeen Palms, we thought it interesting not to turn back. As the arroyo narrowed, masses of soft sandstone, fallen from the vertical walls, blocked the way in the sandy wash of the bottom, but the materials being loose it was tiresome but not difficult to clear a way for the car and so go on once more, and yet again and again. Drifts of boulders made greater trouble but we managed to keep going for about eight miles. Here in the cleft of a deep waterless cañon northeast of and directly under a high point marked 2696 feet on the San Jacinto sheet of the United States Geological Survey we made camp (at about 1000 feet) and began to explore the immediate surroundings.

Certain species are here very common on the sandy-gravelly slopes of the hills as everywhere through the Colorado Desert, such as

Plantago insularis Eastw. var. *scariosa* Jepson and *Chorizanthe rigida* T. & G. Associated with the latter is the less common *Chorizanthe corrugata* (Torr.) T. & G. A very common annual, at this time, is *Perityle emoryi* Benth., still holding its lower fleshy-brittle leaves. In these plants the much flattened achenes show certain kinds of variability. Within the limits of one head we find achenes in which the sides are glabrous (commonly) or puberulent, the edges having a single line of hairs, or each edge may be 2-angled and each angle with a line of hairs, or one edge may be 2-angled and the other 1-angled, thus resulting in 3 lines of hairs. *Rafinesquia neo-mexicana* Gray is not uncommon. *Oenothera brevipes* Gray, with its notoriously variable basal leaves, which are brittle-fleshy, grows in the sandy flats; the tips of the helicoid racemes are now all directed toward the morning sun. Very floriferous low bushes of *Mirabilis laevis* (Benth.) Curran are frequent. There has been considerable rain in the region this year and the bushes of *Franseria dumosa* Gray, normally so scrawny in habit, have taken on an appearance of attractive prosperity. Large beds of *Hesperocallis undulata* Gray, now in fruit, crowd the little low benches bordering the wash, their wavy-margined trough-like leaves imparting a serpent-like effect as they lie along the ground. During our stay not a mammal was to be seen nor was there heard the cry or song of a bird. Even for the desert the place seemed unusually hushed. The maps show no designation for it and, for this reason, the name Silent Cañon was invented.

Masses of the bloom of *Wedeliella incarnata* (L.) Ckl. marked conspicuously a single plant which trailed its stems over the ground in a tiny fork of the cañon. The perianth is a genuine rose-purple and very beautiful. The cluster of 3 flowers simulates a single flower to an interesting degree, the inner lobe of each perianth being reduced to a very short segment. A number of shrubs of the singular *Krameria parvifolia* Benth. inhabited the lower rocky slopes.

The sandy-gravelly slopes carry an abundance of *Phacelia crenulata* Torr., its purple corollas with a whitish eye. *Langloisia setosissima* (T. & G.) Greene is here, from luxuriant plants to small dwarfs. And it is not on every trip into the desert that one is enabled to collect such large fine specimens of *Trichoptilium incisum* Gray, as we obtained. The five paleae of this plant are most beautifully and regularly lacinate into five setae. *Parosela emoryi* (Gray) Hel. is a low spreading bush about two feet high in this cañon. Great colonies of a heleniod plant attracted our attention as they grew on the steep slopes of the arroyo walls. The same species occurred, too, as more or less scattered individuals on the mesas above the walls. The two of us found this plant independently at different places and both felt that it was a novelty, a new species of *Chaenactis*, a little like *C. carphoclinia* Gray on one hand, a little like *C. artemisiaefolia* Gray on the other, but still essentially unlike any *Chaenactis* either of us had ever seen. The flora of the cañon, as we found it, consisted on the whole of fairly well-known species characteristic

of such situations in the Colorado Desert, but this one thing is unique and is here specially described:

Chaenactis peirsonii Jepson n. sp. Plants erect, 4 to 6.3 dm. high, with one or several naked or nearly naked stems from the leafy base; leaves basal, palmate in outline, twice pinnate and then pinnately divided into very unequal linear segments 2 to 16 mm. long; petioles very stout and thickened, almost fistulous; herbage puberulent, the inflorescence tending to be glabrous, the very young stems hoary-pubescent; inflorescence paniculate, widely and openly branched with very scattered heads; heads campanulate or broadly turbinate, 11 mm. high; involucre about 3-5 as long as the disk of flowers; corollas whitish or slightly cream-color; involucre bracts linear, attenuate into slender points, thinly puberulent; receptacular bracts none; pappus-scales 4, sometimes only 2, very short, broad, truncate, 1.5 to 1.6 as long as corolla.

Silent Cañon, in the desert foothills, southeast end of the Santa Rosa Mountains, W. L. Jepson 11,708, Apr. 14, 1927. It is nearest *Chaenactis carphoclinia* Gray, a much more slender plant which has receptacular bracts and flowers with lanceolate pappus-scales a little shorter than the corolla. *Chaenactis carphoclinia* var. *attenuata* Jones has similar short obtuse paleae but is a very slender small plant with filiform branchlets. In *C. artemisiaefolia* Gray, a plant with different foliage, different habit and large heads, the pappus is commonly absent. The leaf segments, too, in *C. artemisiaefolia* are short and broad, whereas in *C. peirsonii* they are long and slender.

NOTES ON THE GENUS *PEDICULARIS* IN CALIFORNIA. The Great Basin region of Utah and Nevada as a physiographical area extends westward to the east slope of the Sierra Nevada. On the basis of general climatology the region of California east of the Sierra Nevada belongs also to the Great Basin area. Not as many Great Basin region plants have, however, been found as far west as the eastern borders of California as might antecedently be expected. Two considerations come to mind in explanation: first considerable areas have only been explored partially or visited at only one season; second, the vast arid region of the Great Basin is characterized by a number of climatic sub-regions, which, while local, influence the distribution of species. As exploration proceeds, it seems likely, however, that additional species of the Great Basin region will be added to the list of species found within the limits of California. In July, 1927, F. W. Peirson collected *Pedicularis crenulata* Benth. a plant of the Great Basin region, at Convict Creek, Mono County, in California. This is the first record known to me of its occurrence in the state. *Pedicularis centranthera* Gray of the southern Great Basin and bordering arid regions was attributed to "S. E. California" by Asa Gray in the Synoptical Flora (2: 309) evidently on the basis of a specimen by Palmer from the Colorado River Valley, but most probably collected in Arizona. This species, very likely, will yet be found in California since it occurs in the desert so near the Cali-

ifornia boundary. It has also been collected at Glenbrook on Lake Tahoe, not far from the California boundary.

The northern part of the North Coast Range region in California is an area which continues, under exploration, to yield species additional to the flora of California, south limit stations of species having their greatest development in western Oregon or western Washington. *Pedicularis Howellii* Gray has already been recorded from the Siskiyou Mountains but *P. contorta* Benth. and *P. bracteosa* Benth. are new to California. *P. contorta* has been discovered near Thompson Peak in the Salmon Mountains at about 7000 feet (Alexander & Kellogg 288), while *P. bracteosa* has been found on Grizzly Creek, northern Trinity Co. (Alexander & Kellogg 281), at upper Campbell Lake, Shackelford Creek, Siskiyou Co. (Butler 1775) and on the summit above Cold Spring, Marble Mt. region (Butler 42).

Berkeley, Sept. 1, 1929.

THE LIFE FORM AND HABITAT OF ERIOGONUM DESERTICOLA WATS.

I. T. WEEKS

Last Sunday I spent considerable time among the sand hills above Gray's Well and Yuma, and covered many acres of *Eriogonum* "forests". Not a leaf was seen and undoubtedly none can be had until the growing season arrives next spring. Some of my notes on this field work will be of interest to you. They are, in part, almost startling to me. Armed with camera and yard-stick, I measured and "shot" several plants that furnish a good idea of what *Eriogonum deserticola* at its best is like. My journey covered what seems to be its center of distribution in the Colorado Desert of southeastern California. From my observations, I would say that it is, pre-eminently, a species of the shifting sand-dune country. No plants were found on absolutely hard or solid ground, and few where the top soil, at least, was not sandy enough to be moved a little by strong winds. Individuals always reached their maximum development on the firmer and higher parts of the great range of shifting dunes in the eastern Colorado Desert; not, of course, on the crests or steep slopes that travel too fast to support any plant life.

The eastern limit of the species coincides with the extreme eastern border of the sand-dunes, beyond which the surface soil is hard and rocky. Westward, individuals were found for about twenty-five miles, that is to within about two miles of the East Highline Canal or to within about eight miles of Holtville. However, as one nears the western limit, the colonies become more scattered, since the locations are apparently governed by the presence of a suitable sandy surface. As to the north and south limits, I learned nothing definite, but would suppose this species extended well into Baja California

and that the northern limit is determined by the range of sand-dunes, a distance of at least fifty miles.

Measurements taken of individuals where they reached their greatest size are truly astounding for a member of the genus *Eriogonum* as I know it. The habitats of most individuals show either a recent removal of surface sand up to several feet, or the opposite, an addition of sand, until only an intricate mass of branches protrude through the surface. In fact, comparatively few plants were found where the surface of the ground seemed "normal". Tap-roots, exposed by the wind, often stood erect one to three feet high, with few or no side roots; but more often, due to a smaller diameter or more removal of supporting sand, they leaned over and made a great arch with the arch supported at both ends by the soil.

These arches, more or less symmetrical, are at least three feet high in the centre, with six feet or more of root-length exposed. At the crown-end where branching takes place, abrupt angles occur, with often very many branches of usually quite small diameter. The tallest plant measured, with normal ground surface, was five feet seven inches high. The greatest horizontal expanse, measured on the ground, where the lower and longest branches procumbently spread on opposite sides of the trunk, was sixteen feet. The trunk sent you was by no means exceptional in size, as I found many larger in diameter and a few that far exceed that one in diameter and length. On this trip I collected one trunk about four and one-half inches in diameter, and nearly four feet tall.

In general, old specimens are procumbent and the lower branches are apt to be greatly extended along the surface of the sand. The branching is usually quite intricate in old plants, but the smaller branches show the typical branching common to the genus.

Imperial Valley, Sept. 20, 1929.

HARRIET A. WALKER

From March, 1905 to November, 1927 Miss Harriet A. Walker served as helper in the Herbarium of the University of California. During her vacations she made collections of the native plants for the herbarium, the duplicates being distributed to other institutions. Her specimens have thus been frequently quoted by specialists monographing various groups. While most of her excursions were in the San Francisco Bay region, she sometimes went further afield, to the Mendocino Range and to the Sierra Nevada about Blue Cañon and Cisco. Born July 27, 1845, in eastern New York, the daughter of a Congregational minister, she graduated from Mt. Holyoke College and was for twelve years an assistant in the Department of Botany at Wellesley College. She died June 26, 1929. *Cirsium Walkerianum* Petrak was named for her.—W. L. J.

THE BOTANICAL EXPLORERS OF CALIFORNIA.—VI.

WILLIS LINN JEPSON

Archibald Menzies

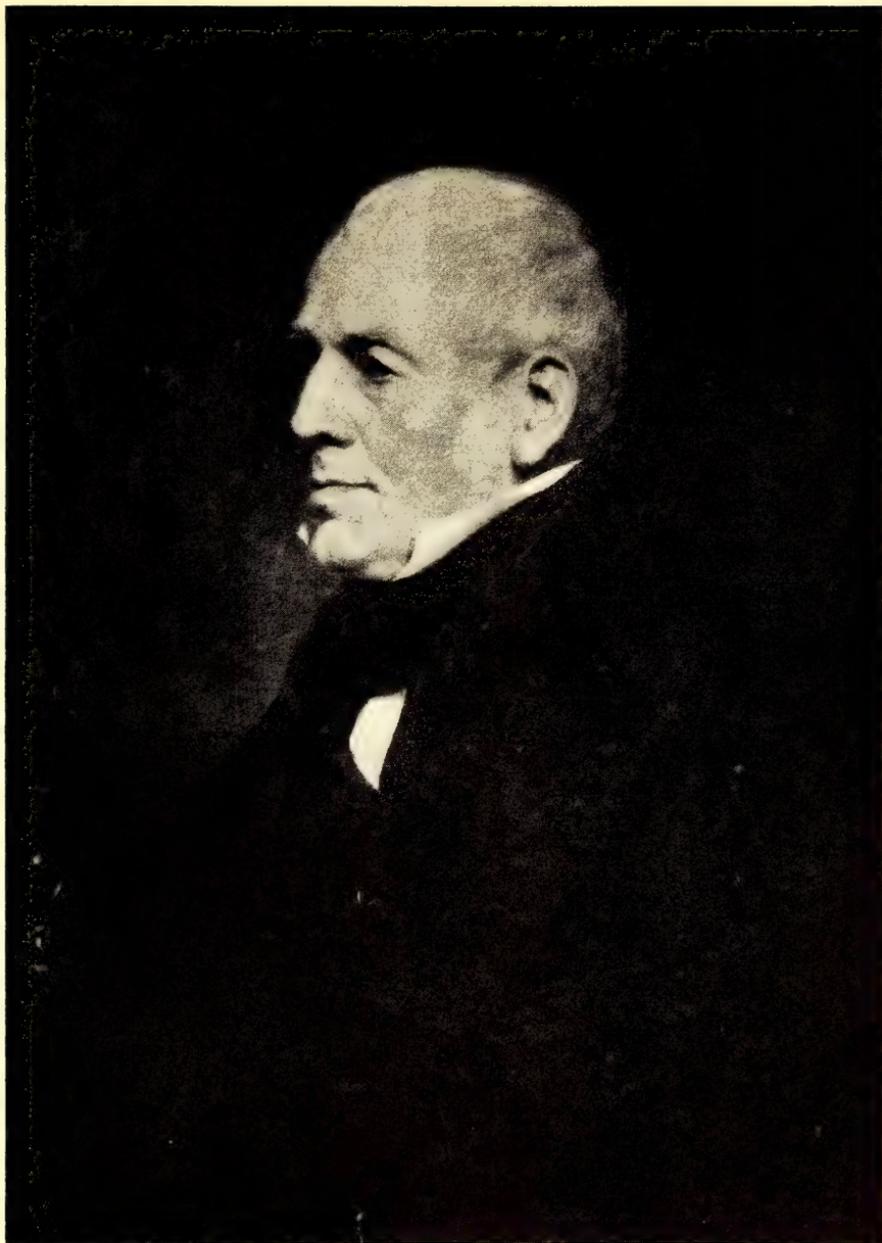
The first botanist to collect along the western shores of North America was Archibald Menzies. Attached to Captain Colnett's first voyage to the Northwest Coast he botanized at various places from Nootka to Bering's Straits in the years 1787 and 1788, but there is little record either of the voyage itself or of Menzies' part in it. In 1790 he was assigned¹ to Vancouver's voyage to Nootka and remained with the expedition until its close.

The expedition consisted of two ships, the *Discovery* and *Chatham*. They sailed on March 17, 1792 from the Sandwich Islands, sighted the Mendocino bluffs in the neighborhood of Fort Bragg and proceeded north to carry on an exploration survey of the coast during the summer. Returning southward in the autumn the expedition entered San Francisco Bay on Nov. 14, 1792, thence going to Monterey and then to the Sandwich Islands. Leaving the islands in the spring, the ships fell in with land on the Humboldt coast where a party went ashore at Trinidad, May 3, 1793, thence proceeding again northward for summer surveying. On Oct. 19, 1793, the expedition again anchored in San Francisco Bay for a second visit, soon leaving for Monterey, thence returning to the Sandwich Islands by way of the Lower California coast. On March 15, 1794 the two ships set off once more for the Alaskan coast and at the end of the season visited Monterey for the third and last time (Nov. 7 to Dec. 2, 1794).

At nearly all places where the ships anchored collections were made by Menzies. The season was often unfavorable and there were other difficulties, but even so, his gatherings of specimens were important and very considerable. In 1792 while the expedition anchored near the Presidio at San Francisco (Nov. 14-24) the botanist went ashore and made notes of the vegetation, but did not join the excursion to San Jose, although writing up in his journal a very lively account of this land journey derived from his brother officers. At Monterey there was full opportunity for shore excursions (Nov. 26, 1792 to Jan.

¹ For his appointment as surgeon and botanist to the Vancouver Expedition Menzies was indebted to Sir Joseph Banks. Sir Joseph was a great personage in his day. A patron of science, perhaps to be regarded as the real founder of the Royal Botanic Gardens at Kew, President of the Royal Society, he had all the influence which goes with education and learning, great wealth, high social station and an agreeable personality. In addition he had what is known as the grand manner and was very much in the public eye in the London of that day. There was no one in the great metropolis of any consequence, we may say, but that knew him personally or knew of him. On the occasion of my last visit to the Natural History Museum in London, the Keeper of the Herbarium, Dr. A. B. Rendle, called my attention to some framed caricatures of Sir Joseph hanging on the wall of his study, good-natured cartoons scattered about the town over one hundred years ago.

Sir Joseph went out with Captain Cook's third voyage as a member of the scientific staff. Banks Island on the British Columbian coast was named for him.



ARCHIBALD MENZIES, F.L.S.

Reproduced from an oil painting by E. N. Eddis hanging in the assembly chamber of the Linnean Society, Burlington House, Piccadilly, London.

14, 1793) and his journal shows that he covered exactly the stations where *Arctostaphylos tomentosa* Pursh grows and of which Menzies² was the first collector. Mistakenly attributed to the "Northwest Coast", for a full century this species was thought to grow along the Oregon and Washington shores. Without doubt Menzies must have collected his specimens at Monterey, the shrub of the northern coast being a different one, namely *Arctostaphylos columbiana* Piper, long known, but not named until recent years.

In 1793 the expedition anchored at Trinidad for a few days (May 2-5), but according to his journal Menzies did not accompany the watering party ashore. While this is the type station for his new *Ribes*, *R. Menziesii* Pursh, it may be said that the journal shows that the various members of the ship's company, in the interest of the naturalist, were in the habit of bringing objects of natural history to him. In the autumn the expedition again sailed southward from the British Columbian coast. The *Chatham*, with Menzies aboard, anchored for one day (Oct. 20) in Bodega Bay and a shore trip was made. Going on to San Francisco Bay, Menzies rejoined the *Discovery*, his regular berth, but the unfriendly attitude of the new Spanish commandant furnished Captain Vancouver a reason for not permitting the botanist to continue his field work here. After a few days in this port (Oct. 21-24), the ships sailed for Monterey, where for the period of the stay (Nov. 1-6) similar restrictions were in force. Going on down the coast, Vancouver and his officers were received hospitably at Santa Barbara (Nov. 10-18), where Menzies made several botanizing trips. At San Buenaventura (Nov. 18-22) he did not land, but enjoyed shore excursions at San Diego (Nov. 27 to Dec. 9).

In 1794 the *Discovery* and *Chatham* anchored for the third time at Monterey. Their reception by the Spanish officers on this occasion was most hospitable and many land trips were made. It was during this stay that Captain Vancouver made a journey to the Vancouver Pinnacles east of the Salinas River. A launch was sent across Monterey Bay to Santa Cruz for fresh provisions and Menzies may well have gone with her and at this time have collected the Redwood, though I possess no portion of his journal covering the year 1794. In any event, the original specimen of *Sequoia sempervirens* in the National History Museum bears the legend on the back of the sheet, "Santa Cruz, Menzies." At no place in the journal before me, however, does Menzies mention seeing this most remarkable of all Californian coastal trees, either near Monterey or elsewhere, though indubitably he saw it at Trinidad, where it covers the high slopes near the shore with a stately forest.³

After the return of the expedition to England, the plant collection was not, unfortunately, worked up as a whole under one direction.

² The writer first examined the Menzies specimens at the Natural History Museum in 1905.

³ The great trees of this forest have now been logged.

While the first set went to the government and is now preserved in the National Herbarium at the Natural History Museum in London, special portions of the duplicates were presented to various botanists and publication of the new plants was done piecemeal in a scattering manner and usually after long delay. An unfortunate lack is the frequent absence of definite stations for the collections, which has resulted, in some cases, in no little confusion. Perhaps about fifteen years since the existence in manuscript of a Menzies' journal of the Vancouver voyage, preserved in the British Museum, was called to the writer's attention. Several years later through the intervention of his friend, Mr. E. G. Baker, of the Natural History Museum, a copy was made of the Pacific Coast part of the manuscript.

It was with the highest expectations that I looked forward to reading Menzies' own account of his discovery of the many new species on our coast line, where no botanist save Haenke had been before him in California. With the Menzies journal in hand, a carefully prepared and validated transcript, it was at once obvious that one possessed a valuable historical document, but it was also apparent that it contained comparatively scanty records regarding the native vegetation. In the journal Menzies from time to time makes a few notes, in more or less general terms, of his botanical excursions ashore, but on account of the utter strangeness of the vegetation his comments are not, on the whole, of much significance. At that time the importance of a strictly scientific botanical journal with a numbering of specimens in sequence by stations and dated as collected was not appreciated and such careful methods in the way of field research work had not then been developed.

On the other hand the journal is amply filled with other matters. Save for the references to himself as a botanist just noted one might suppose from reading the manuscript that Menzies was the navigator or geographer of the expedition. The progress of the Discovery or her consort, the Chatham, every storm that impeded, every wind that aided their movement is faithfully set down. He records the land-falls and their appearance, the channels, the islands and the straits, the nature of the shoreline and the aspect of the country back of it. Ashore, with evident eagerness, he describes the natives, their physique, features, dress or absence of it, personal habits and tribal customs, food and means of subsistence. The missions in California are depicted and considerable space given to their industries and agriculture. The movements of the trading ships and the bartering for otter skins and furs came under his appraising eye. He was the first to make a correct guess as to the nature of the then unknown animal, the Rocky Mountain goat⁴, that furnished the "fine long white wool" used by the natives for their superior cloth on the upper coast of what is now British Columbia. The amazing runs of salmon in the mouths of the small streams emptying into the

⁴Oreamnos montanus (Ord), a kind of antelope or chamois, not in the least of the goat family.

archipelago waters on the British Columbian coast, the habits of an enormous school of otters with their young which an exploring party one day chanced into in the same waters, the prices of cattle and fowl in California, the structure and make of the water-tight canoes in the Santa Barbara Channel—all these and numerous other matters testify that, in all probability, few things escaped his naturalist's eye. Faithfully and industriously he made every effort to carry out zealously the instructions of the Admiralty as prepared for that office by Sir Joseph Banks.⁵

Moreover the journal merits high praise in itself. Its statements are characterized by restraint and sobriety, and yet its descriptions are earnest and vivifying. The style, while occasionally a little pompous, is on the whole, nervous and forceful, showing an excellent command of the English vocabulary and exhibiting the writer as a man of deep thought and wide and careful observation, with a philosophical cast to his reflections. It is, by and large, an animated journal and difficult for any one interested in Pacific Coast history to lay down after once begun.

The transcript of the Pacific Coast part of Menzies' journal, as made for my use, consists of 752 pages. The first entry is that of April 15, 1792, when the Discovery and Chatham were approaching the Mendocino coast in the neighborhood of the present Fort Bragg. The last entry is that of Dec. 15, 1793, off the Lower California coast. The record covers, during the years 1792 and 1793, the activi-

⁵ As one of the scientific staff on Cook's third voyage, Sir Joseph had had experience as an explorer and was mindful of the needs of a surveying voyage and took an especial interest in the welfare of the expedition to Nootka under Vancouver. His letter of instruction to the botanist may to this day be regarded as a model of its kind. Menzies, therefore, reported to Sir Joseph by letter during the course of the voyage and on his return at the end of it. These letters are in the Banks Correspondence at the Natural History Museum, London. By the kind permission of the Keeper of the Herbarium, Dr. A. B. Rendle, they were copied for me in 1926. Letters of this kind are more intimate and revealing than a journal which is made with the idea of being filed with governmental authorities. In these letters Menzies discusses amongst other things the affair of Thos. Pitt, Lord Camelford, son of the first Lord Camelford who was a nephew of the great William Pitt, first Earl of Chatham. As the Honorable Thos. Pitt, Lord Camelford had joined the crew of the Discovery as an Able Seaman. While on the voyage his father died and he thus became Lord Camelford. For insubordination he was thrice flogged at the order of Captain Vancouver, kept in irons, and discharged from the ship at the Sandwich Islands. Flogging has of course long since been abolished but it is, we think, one of the glories of the British navy that a lord could be flogged at the masthead just like a common sailor, or in other words that the rules and tradition of the naval service exerted greater force than the claims of nobility. This matter of Camelford has an especial interest because Menzies himself, as revealed by his letters, was put under arrest and perhaps only escaped flogging or the indignity of irons by reason of his judicial temper. It has indeed long been a wonder with me that Menzies, though generally acknowledged mild and just in disposition, came out so well in the end; but the return voyage brought the expedition into the Thames River in 1795 and he was enabled to appeal immediately to his great friend and powerful patron, Sir Joseph Banks.

ties of the Vancouver survey from San Diego to the northern coast of British Columbia.

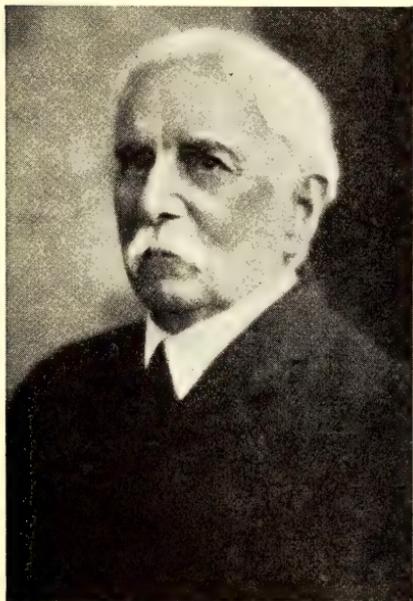
By birth Archibald Menzies was of Scotland and belonged to a race of gardeners and botanists. Born at Aberfeldy in Perthshire on March 15, 1754, he became a gardener at the Royal Botanic Garden at Edinburgh. At this place he attracted the attention of Dr. John Hope, Professor of Botany, who encouraged him to acquire the training of a surgeon at Edinburgh University. Subsequently he was attached to the navy in a surgical capacity. After returning from the Vancouver voyage he served in the West Indies, after which he lived as a practising surgeon in London where he died Feb. 15, 1842. The name Menzies is properly pronounced as if spelt Minges, but we in California have so long spoken the name phonetically that our pronunciation has come to have, in western America, the force of usage. The fame of Menzies is commemorated by many western plants. Our madrono, a tree than which none other in the western woods is more marked by sylvan beauty, is well known by its latin name, *Arbutus menziesii*, while the genus *Menziesia* includes seven species of arborescent or low shrubs of North America and eastern Asia.

One evening in 1906 found me at a meeting of the Linnean Society in Burlington House, Piccadilly, London. The walls of the assembly room are hung with oil paintings of the past presidents of the Society, distinguished names all. Dr. B. Daydon Jackson, the Secretary, called my attention to one of them in particular. It was that of Archibald Menzies who held the presidency after the death of A. B. Lambert. The portrait is by E. N. Eddis, a copy of which is reproduced in this issue of Madroño.

[Cf. G. S. Boulger, *Dict. Nat. Biog.* 13:258. Menzies' Journal of Vancouver's Voyage, April to October, 1792, ed. by C. F. Newcombe (*Archives of British Columbia*, mem. 5, pp. 1-171,—1923). J. Forsyth, *Biographical Note [on A. Menzies]* (*Archives of British Columbia*, mem. 5, pp. vii-xii, with two portraits and three illustrations, 1923). A. Menzies, *Journal of Vancouver's Voyage along the Pacific Coast of North America*, pp. 1-752. ms. | Menzies' Letters in the Banks Correspondence. ms. | Meaney, E. S., *Biography of Archibald Menzies (Vancouver's Discovery of Puget Sound, 295-297,—1915)*. In this highly interesting book Meaney says that Menzies himself gives an account of the voyage in Loudon's Magazine of Natural History, vols. 1 and 2. These articles, however, relate entirely to his ascent of the mountain Whararai on the island of Owhyhee. It seems likely that this statement is copied from the Dictionary of National Biography (13:258).]

Daniel Cleveland.

One of the localized lip-ferns of the foothills of San Diego County is *Cheilanthes Clevelandii* Eat. It was named for Daniel Cleveland, for sixty years a resident of San Diego, who gave his leisure to the pleasures of collecting and study of the native plants.



DANIEL CLEVELAND

Ferns had for him an especial interest but he neglected few of the great groups of the plant kingdom. Being a pioneer he naturally gathered many new things. At a very early period he began to send plants to Asa Gray, who named for his correspondent a new *Pentstemon*, *P. Clevelandii*, discovered by Cleveland in Cañon Tantillas, northern Baja California, but which later turned up at several stations in the mountains of coastal Southern California. Gray also named for him an endemic *Salvia* of San Diego's chaparral slopes as *Audibertia Clevelandii*.

One vacation period, in June, 1882, he spent in Lake County at Allen's Springs and thus *Astragalus Clevelandii* Greene and *Linum Clevelandii* Greene were named for him, as also the well-marked *Senecio Clevelandii* Greene from the same region. Greene likewise named the Shooting Star of San Diego County as *Dodecatheon Clevelandii*, and also *Spergularia Clevelandii* (Greene) Rob. from the same district. The month of July, 1882, Cleveland botanized in Plumas County, mainly about Prattville. Otherwise, his botanical trips were for the most part into the back country of San Diego County which was then much larger than it is at the present time.

In that early day, brand-new generic types were not infrequently discovered in one or other of the Californias. In 1883 Lyman Belding collected in the Victoria Mountains of Baja California a new plant which Greene published as *Orthocarpus Beldingi* (Bull. Cal. Acad. 1:123) but soon used as the type of a new genus *Clevelandia* (l. c. 1:182) in honor of Daniel Cleveland. Thereupon the author of the genus writes contentedly to Cleveland: "You and Bebb¹ are nicely disposed of *generically* according to my reckoning" (Cleveland Corr. 87, ms.); but Asa Gray felt that the step was not well-

¹ Referring to the genus *Bebbia* in honor of M. S. Bebb, the salicologist.

taken and writes to Greene, "I wish you had given a better genus to good Cleveland" (Letters Witty and Salty and Wise, 278, ms.). While admitted in Engler & Prantl's *Die Naturlichen Pflanzenfamilien* (4^b: 99), it is with the qualifying remark: "Die Gattung ist von *Orthocarpus* nur schwer zu trennen." Aside from the ultimate fate of this genus, Cleveland's name is well perpetuated by many specific names which give remembrance to his lifelong interest in the indigenous flora.

Born March 21, 1838, at Poughkeepsie, New York, Cleveland studied law and was licensed in 1859. From 1859 to 1866 he followed his profession in San Antonio, Texas, of which city he was mayor for one year in 1865-1866. In November, 1867, he came to San Francisco, thence to San Diego in May, 1869, where he practiced law and became well known in the city's civic life. The San Diego Society of Natural History is only one of many organizations which he helped to found and make prosperous. To San Diegans he was more than an attorney-at-law—he was a scientist, local historian, hard-headed man of affairs, humanitarian and religious leader who crowded many achievements for the betterment of the city into his busy days. The years of his life, ninety years and nine months, ended at San Diego on Jan. 3, 1929.

Cleveland's distributed plants are mainly preserved in the Gray Herbarium and the Greene Herbarium, though some are to be found in the University of California Herbarium. He never sold any plants or made collecting a business. The Cleveland Correspondence (ms.), includes many interesting letters from Asa Gray, Geo. E. Davenport, E. L. Greene, C. C. Parry, Geo. Vasey, Geo. Engelmann, J. G. Lemmon, S. B. Parish and many other botanists and botanical collectors. So far as memory serves he published little in botany; a list of names of the marine algae collected by himself at San Diego which is appended to Orcutt's "Flora of San Diego Co. and Lower California", pp. 12-13 (1885); also a series of articles on "Bee Pasturage Plants of San Diego County, California" in the periodical *Bees and Honey* for 1928, written in the same year.

Never robust physically, Cleveland went about seeking health on many a vacation trip, and as he went he made botany a recreation. Greene writes him: "I hope you gain strength in your mountain sojournings; and you surely add to the knowledge of our state flora wherever you go" (Cleveland Corr. p. 39, ms.). Most of his letters, it may be noted, contain some reference to his bodily ailments. Perhaps, as they humorously say in New England, he was one of those who enjoyed poor health and thus came into the fullness of enriching well-spent years.

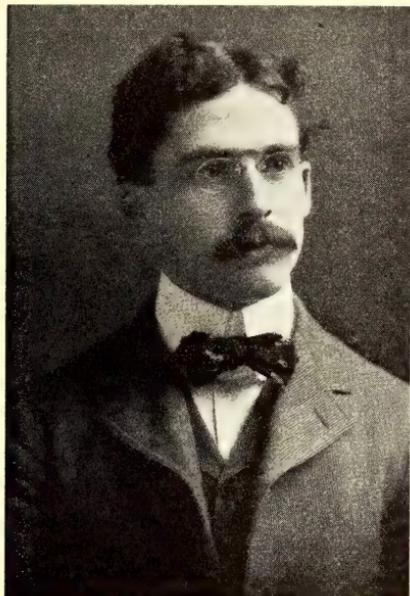
[For further details as to his life and activities consult: Biographical sketch in *San Diego Union*, Jan. 4, 1929. Cleveland Correspondance, pages 1-547, ms. *Botanical Letters of Other Days*, pages 72-91, ms.]

Harley Pierce Chandler

The high mountain region which lies between the Klamath and Salmon rivers in northwestern California possesses remarkable features. The geological designation, Klamath area of Diller, includes it but one finds no special name on present day maps. Botanists

speak of it as the Marble Mountain region and have a special interest in it because characterized by such remarkable endemics as *Picea Breweriana*, *Lewisia Cotyledon*, *Draba Howellii*, and a number of other significant species.

H. P. Chandler, the first botanist to explore the region, entered it from the direction of Eureka by way of Hupa Valley and Weitchpek in June and July, 1901, and went out eastward to Etna Mills. He traveled with a pack animal and made, including several new species, a large collection, which was distributed in the form of sets to a number of the principal herbaria of the United States and Europe. The specimens were named by the writer and Mr. Jos. P. Tracy.



HARLEY PIERCE CHANDLER

For about eight years subsequent to the Marble Mountain trip, Mr. Chandler continued, during intervals of school teaching, to collect in various parts of California, chiefly in the central and southern Sierra Nevada, in western San Diego County and the central Coast Ranges. The first set of his specimens was given to the University of California Herbarium. A peculiar labiate of the San Diego coast, which he discovered, was named *Calamintha Chandleri* in his honor by Thomas S. Brandegee.

Born in Beaver Dam, Wisconsin, on Aug. 26, 1875, he received his earlier college education at Pomona College in Southern California and then entered the University of California where he took the Bachelor of Science degree in 1902. On coming to Berkeley his interest in botany was continued and confirmed as the major recreation to which he devoted all his leisure. His study of the Baby Blue Eyes group resulted in a critical paper, "A revision of the genus *Nemophila*", published in the *Botanical Gazette* (34: 194-215, pls. 2 to 5) in 1902. His capacity for taking infinite pains found an outlet in photographic studies of the native vegetation, an example of which, *Argemone intermedia* var. *corymbosa* Eastw., may be found in Jepson's *Flora of California*, vol. 1, fig. 116. One of

his characteristics expressed itself in a fine sense of orderliness, industry and thrift. After a period of residence in southern Texas (1915-1916) he returned to San Jose, California, where he died May 6, 1918.

THE ANNUAL DINNER FOR 1928

About ninety members of the Society and their guests gathered at the Pig'n Whistle Restaurant in Berkeley on Saturday evening, February 18, to celebrate the annual dinner under the lead of the Toastmaster, Mr. Fred W. Koch, head of the Science Department of the Galileo High School, San Francisco. A brief discussion of various wheat cultures was made by Professor W. W. Mackie. A traveler's impressions of the flora of Palestine were given in a talk illustrated with lantern slides by Dr. W. F. Bade, Director of the Palestine Institute, and Dr. L. R. Abrams of Stanford University spoke in memory of Mr. S. B. Parish who died June 5, 1928. This memorial was brief but happily and aptly worded. In connection with it Dr. Abrams read two letters which he had received from Mr. Parish in recent years. Both letters, he said, portray well the character of the man and his keen interest in botany, even in his declining years. The first is only a short note but it shows how clear and retentive his mind remained, for it was written in his eighty-ninth year, a few days following the annual dinner of the Society two years ago. This letter refers to a desert plant collected by Mr. Parish over forty-five years before. The second letter relates to the great Berkeley fire of September, 1923, which almost without warning swept twenty-five city blocks and included the Parish home at 1668 Scenic Avenue in that terrifying disaster.

Berkeley, February 14, 1927.

Perhaps it may be worth while to put in writing what I said to you the other evening about the specimen of *Calliandra eriophylla* from Mesquite Cañon. Mesquite Station was in early days the name of a siding on the Southern Pacific some distance east of Mecca, and the road ran there, as I remember, some two or three miles from the bases of the hills to the south part, I suppose, of the so-called Chuccawala Range. Mesquite Cañon was the nearest dry wash running into these hills, and C. C. Pringle and I walked over to it and spent the night on the sand and in the morning ascended the wash some distance, coming back to the railway in the evening. The exact spot where we got the *Calliandra* I do not recall. I think this is the only California collection of this species that has been made. There are many good things, I think, yet to be discovered in that region.

S. B. Parish.

Apt. 16, The Merrill, Berkeley,
October 1, 1923.

I should have written to you before this, but there has been much to do, and so much confusion, since the fire. Today I have your kind note and will no longer delay.

The fire swept down with the greatest rapidity before the strong northern gale, and we had about 20 minutes to prepare. The University boys carried almost everything out of the house and piled it on an adjoining vacant lot, where it was burned up. We escaped with what we had on, and what we had hastily thrust into two grips. We got this apartment the same evening, and were thankful to get a roof over our heads.

While the fire took most of the things carried out of the house, some things must have been taken away, for a few trifles have since been brought to us. The real reason I delayed writing to you was that I had a faint hope that some one might have picked up the manuscript of my Mojave paper and saved it for me. But the chance is infinitesimal. I had put it and some notebooks in a small grip, and I blame myself that in the confusion it was not cared for.

I thank you most sincerely for the interest you so kindly took in it and Stanford University for its willingness to publish it. It was practically finished, needing only the copying of a few pages—and I was not entirely dissatisfied with it after this final revision. The introduction was the expansion of a paper I read to the Sinapsis Club at the Citrus Experiment Station, and they had a copy of it made by their stenographer. The Systematic Catalogue was based on one I made for the Desert Laboratory. Possibly from these papers I may try to reconstruct the thing. But all my notebooks are gone, and the undertaking seems formidable. Any thought of the kind must wait until we are once more settled; then I will know if I have courage to try.

We fortunately had considerable insurance, so that we can rebuild, or buy a new house, but it will have to be a smaller and poorer one than we had, at the present exorbitant prices of labor and material. My wife faces the loss with the greatest bravery, and I try to imitate her, and we are both well.

S. B. Parish.

The main address of the evening was made by the guest of honor, Dr. Carl O. Sauer, Professor of Geography in the University of California, who spoke on the relation of the plant cover of a country to its geographic problems.—W. L. JEPSON.

THE ANNUAL DINNER FOR 1929

The annual dinner of the Society for 1929 was held in Berkeley on February 23. The dinner itself was preceded by an all-day session held in Wheeler Hall, at which professional papers were read. At

the morning session Professor W. A. Setchell of the Department of Botany, University of California, presided, at the afternoon session, Professor W. W. Mackie of the College of Agriculture, University of California. The papers read fell under twenty-one titles as follows.

Morning session: Effect of high temperatures on coniferous seedlings, by Frederick S. Baker, Division of Forestry, University of California. Factors affecting the photosynthesis rate and the sugar-starch relation in the leaf, by R. M. Holman, University of California. Reversible environmental modifications of *Ruppia*, by William Albert Setchell, University of California. The University of California Botanic Garden, by T. H. Goodspeed, University of California. Tertiary climates as indicated by fossil plants, by R. W. Chaney, Carnegie Institution of Washington, D. C. The growth of plants in a controlled environment as related to ecological investigations, by A. R. Davis, University of California. The significance of local plant names in relation to the prehistoric and historic contacts of the Philippine peoples, by Elmer D. Merrill, University of California. The species of Hopi corn, by W. W. Mackie, University of California. The use of native plants by primitive peoples and early settlers in California, by Mrs. I. M. Blochman.

Afternoon session: The relationship of the Monocotyledons, by Douglas H. Campbell, Stanford University. Spreading versus appressed pubescence as a diagnostic specific character, as illustrated by the genus *Lupinus*, by Charles Piper Smith, San Jose High School. Chromosomes and classification in *Crepis*, by E. B. Babcock and Lillian Hollingshead, University of California. Structural features of wind blown pollen in relation to plant identification and classification, by H. E. McMinn, Mills College. The concept of the genus with illustrations from the ferns, by E. B. Copeland, University of California. The herbaria of the U. S. Forest Service, by Fred P. Cronmiller, U. S. Forest Service. The history of the coastal pine forests of California, by Herbert L. Mason, University of California. *Pinus jeffreyi* and *Pinus ponderosa*, by N. T. Mirov and C. L. Hill, U. S. Forest Experiment Station. Some popular fallacies concerning the growth of the California redwood, by Emanuel Fritz, Division of Forestry, University of California. Application of botanical knowledge to management of forest resources, by Leland S. Smith, U. S. Forest Service. Ecological changes in the Sierra forests, by O. M. Evans, U. S. Forest Service. A forest map of California, by Duncan Dunning, U. S. Forest Experiment Station.

The dinner in the evening was held at the Belle de Graf Restaurant and was attended by eighty members and their guests. Dr. H. M. Hall of the Carnegie Institution presided as Toastmaster. Mrs. Hilda Grinnell spoke happily on the pleasures of field work and Mr. W. I. Hutchinson of the United States Forest Service gave an illustrated lecture upon the new wilderness areas set aside by the Forest Service within the national forests of California. The company was also favored with several songs by Mr. Robt. E. Saxe, who was accom-

panied on the piano by the Society's musician-laureate, Mr. W. W. Carruth. The dinner committee was under the chairmanship of Mr. H. L. Mason.—W. L. JEPSON.

CHARLES RUSSELL ORCUTT, NATURAL HISTORY COLLECTOR.

For something over half a century Charles Russell Orcutt of San Diego has been identified with the desert areas of the southwestern United States and the adjacent regions of Mexico as a professional collector of insects, shells and plants. Botanizing in districts never before traversed, he discovered many new plants in a wide range of families. This material he sold to botanists and institutions. In only a few instances, if memory serves, did he himself publish his own discoveries as new species—and yet he was much given to publication of a kind, especially lists of species. His check list of the "Flora of Southern and Lower California" (13 pages, 1885) was sufficiently creditable in typography and much used by collectors. It was followed by a fuller list, "Botany of Southern California", in 1901 (172 pages). In 1884 he began to print a monthly journal under the caption, *The West American Scientist*. It was at that time the only medium that existed in western America for the publication of natural history notes and short articles and it, therefore, served a useful purpose. Among the contributors were such notable names as C. C. Parry, Edward Lee Greene, T. D. A. Cockerell, Josiah Keep, C. H. Eigenmann, Alice Eastwood and Geo. Vasey. Without pretensions typographically the issues nevertheless maintained a fairly uniform character for about ten years and then trailed off into chiefly advertising leaflets, irregular in size, title, make-up and form, which have been the despair of librarians who felt it a duty to maintain complete files of the journal for their "Californiana". The most happy of his writing efforts are somewhat short articles, contributed mainly to *Garden and Forest*, which give a running account of his own journeys in the desert or of the little-known elements of its flora.

As a collector and publisher Mr. Orcutt became widely known for his zeal and industry and also for his eccentricities and foibles. A characteristic production entitled "American Plants" (3 vols., 1907-1910) is a strange medley which illustrates the author's singularities. All of his publications have, at least, developed the merit of rarity. As a sort of promoter he projected most visionary botanical schemes but practically no botanists were deceived, though often much amused, by them. Although so peculiar in his business dealings with customers, he was not evilly disposed, nor malicious nor vindictive, but rather simple-minded and naive, with an intense devotion to field work which was wholly genuine and unflagging. Through him numerous desert plants, especially Cactaceae, have been introduced into cultivation. The genus *Orcuttia*, which includes two peculiar grasses of California and Lower California, was dedicated to him by Dr. Geo. Vasey and many species bear his name.

Born in Hartland, Vermont, on April 27, 1864, he came in 1879 to San Diego and there made his home for the remainder of his life. While exploring the West Indies he died in Haiti on Aug. 24, 1929.—W. L. JEPSON.

OPEN LETTERS

On *Geraea viscida* (Gray) Blake.

I am sending a package of *Geraea viscida*, including two roots. These plants were collected near Jacumba, California, at about 2800 feet altitude. This *Geraea* grows in hard red clay soil and has a deep tap root. The remains of last year's stems show it to be at least a biennial, but judging from the size and depth of the root I would take it to be a perennial. The way the heads, after anthesis, become abruptly reflexed is worthy of note.—J. B. FEUDGE, May 28, 1927.

Vaccinium ovatum in the Santa Cruz Mountains.

On October 13, 1929 two forms of *Vaccinium* were observed near the Big Basin in the Santa Cruz Mountains. The common kind, *Vaccinium ovatum*, has a perfectly globose fruit without bloom. Please note that the other (var. *saporosum*) has a very pronounced pear-shaped fruit with bloom. The leaves of the pear-shaped one, too, are strikingly darker in color.—H. A. DUTTON, Los Altos.

Rediscovery of *Stipa Stillmanii* Boland. in Placer County

When collecting plants on the Sugar Pine Range, about twelve miles northeast of Forest Hill along the road between the Sugar Pine Ranger Station and Forbes Cattle Camp, I noticed a rather tall grass with plume-like top. It was a new grass to me, so I put several stalks in my press to work with later, not suspecting I had found anything rare. This location is on the road east of Iowa Hill, which is just across the American River Canyon from Colfax and only a few miles in an air line.

After I found that my specimen was *Stipa Stillmanii*, I looked for it around Colfax and eastward, but I have never seen it off the Forest Hill Divide and only in fairly dense shade. Since finding the one clump near the Sugar Pine Station, the ranger has found one other clump. Last week, also, we located another small area on the east slope of the Red Star Ridge, in what is known as "French Meadows", in T 15 N, R 14 E. I am sending some pictures of the last station, showing several of the plants. There are about twelve individual plants here. Jepson's Manual cites Blue Canyon as country in which it is found, but so far I have not seen it there.—LELAND SEYMOUR SMITH, Aug. 1, 1929.

Picea Breweriana Wats.

I wish to report that, on a recent trip, I saw the Brewer Spruce on the north slope of Little Grayback, Josephine County, Oregon. This point is much further north than the point where, you will recall, we located the trees on the pass above the Oscar Beer Ranch on the Expedition of 1908. On Little Grayback was found a tree that I consider a perfect specimen of *Picea Breweriana*. It was not growing on the cliffs, but at the edge of the regular forest in deep soil. With its veil of "weepers", I thought it was the most beautiful tree I have ever had the pleasure of seeing in our forests. The Little Grayback is the dividing mountain between Deer Creek and Little Grayback Creek, and constitutes the most northerly spur of the Siskiyou range.—JAMES DAVIS, Oct. 7, 1929.

New stations for trees in Oregon.

In August, 1917, I found *Cupressus Macnabiana* well established on Sterr Peak, 5809 ft., and on one or two adjacent peaks in Josephine County, Oregon, and have a specimen of *Chamaecyparis Nootkatis* from Whiskey Peak, Josephine County, Oregon, three miles from the California line, so that you see we may yet find it south of the line and thus add one more arborescent species to your California list.

I have found *Populus tremuloides Vancouveriana* very scattering but well established in the Willamette Valley. It had previously passed for the species which does not occur west of the Cascade Mountains. Most of the variety has now been exterminated by the settlers in clearing the land.—MARTIN W. GORMAN, Portland, Ore., Oct. 19, 1919.

THE DEPARTMENT OF BOTANY AT STANFORD UNIVERSITY.

Botany at Stanford University is represented by a group of eight men, five of whom are technically the Department of Botany, and three Professors or Assistant Professors of Biology. These are respectively Dr. Douglas H. Campbell, now Emeritus but actively working in the laboratory, Dr. L. R. Abrams, Curator of the Dudley Herbarium and Professor of Systematic Botany, Dr. Gilbert M. Smith, morphologist, algologist, and anatomist, Associate Professor James I. W. McMurphy, plant pathologist, Professor Geo. J. Peirce, physiologist; and Dr. L. B. Becking, cellular physiologist, Dr. L. L. Burlingame, geneticist, and Dr. A. G. Vestal, ecologist. To this list should be added the names of three Lecturers in Botany, Mr. Samuel B. Parish,¹ systematist and collector of the Parish Herbarium, Mr. William F. Wight, plant breeder, of the U. S. Department of Agri-

¹ Deceased June 5, 1928.

culture, and Dr. William A. Cannon, physiologist, formerly of the Carnegie Institution of Washington; and of Mrs. Roxana S. Ferris who, as Assistant in the Dudley Herbarium, gives help to every student of the Pacific flora who has occasion to use the Dudley Herbarium, and whose published work on the local and more distant floras is well known. The present personnel is the product of the ideas and ideals of Dr. Campbell and the late Professor Dudley. One may conceive a group of botanists concentrating on one or two or a few lines and, assuming ability and industry, making a correspondingly impressive contribution to the science; and one may imagine another group composed of men of diverse interests but united by one common interest—the study of plants—who will touch human life at just so many more points, and who will impress their students and the rest of the world with the corresponding breadth and importance of botanical science, which their contributions will tend to keep plastic and growing.

What should be the ideals of a University group of botanists? Should they regard their function chiefly as that of contributors to knowledge as forming an academy of science or as the distributors of knowledge already and elsewhere acquired? And should they, any more than any other citizens of a commonwealth, indulge their own tastes without consideration of the relative values of different kinds of results in the cooperative society of which they are members, and from the success of which their own comfort and even existence depend?—GEO. J. PEIRCE.

ORDINANCES PROTECTING NATIVE PLANTS.

During the last year ordinances were passed in both San Diego and San Bernardino counties which prohibit the collecting of certain wild plants growing in those counties. In both ordinances nearly all species of cactus are named, as well as a number of species of herbaceous and shrubby plants. As a result of the activities of nurserymen and landscape gardeners of southern California who collect the cacti by truck-loads, some of the rarer species of cactus are bordering on extinction and other species which were once abundant are becoming rare. The San Diego ordinance was enacted after many of the plants of *Agave shawii*, growing at the type locality of the species had been carried off and many other plants had been left up-rooted to die. Among the desert shrubs that the ordinances aim to protect are *Ocotillo* (*Fouquieria splendens*), *Desert Holly* (*Atriplex hymenelytra*), and *Smoke Tree* (*Parosela spinosa*). The Samuel B. Parish Botanical Society of Riverside and San Bernardino has advocated the passage of an ordinance in Riverside County similar to the ordinances of San Diego and San Bernardino counties. Such an ordinance would protect the remarkable growth of cactus known as the Devil's Garden near the east entrance of the San Gorgonio

Pass in the northern Colorado Desert. Because of its accessible location and the number of persons preying on its cactus-resources, if it is not protected this natural cactus garden will soon be devoid of the unique charm it now possesses. It is sincerely hoped that after the passage of these ordinances they will not be forgotten and that persons detected breaking them will be punished as the law provides.—J. T. HOWELL, Nov., 1928.

CALIFORNIA MYCOLOGICAL SOCIETY.

ELIZABETH E. MORSE

In order to become more familiar with the Fungi which occur in this state, especially with those which are destructive or beneficial, edible or poisonous, the California Mycological Society with headquarters in the Botany Building, University of California, Berkeley, has been formed. There are several branches in different parts of the state and there is an adviser in each branch. The interest of the schools and colleges has been enlisted, also that of lumbermen, orchardists, campers, hikers and tourists. Specimens are being sent to the mycological laboratory from many localities, and these are now being classified. The extent of the work may be realized when we consider the size of the state, and the fact that fungi occur in all latitudes and altitudes, and are both terrestrial and lignatile. The comparative paucity of literature on this subject increases the difficulties encountered. California species frequently do not fit descriptions of similar species met in other parts of the world, particularly from the fact that they often attain unaccountable dimensions. There are indications of the presence of some species not previously met, or, at least, not recorded.

One of the most important functions of the Mycological Society is to lend as much aid as possible to the building up of an herbarium of representative plants of the state. The Society's herbarium at the present time has comparatively small numbers of fungi in its collections, except for some special groups that have been more thoroughly studied. Such material is invaluable for purposes of reference and comparison. Those who realize the importance and value of this work, and who would like to render assistance are invited to send specimens, together with carefully prepared notes as to habitat, elevations, and conditions of growth, to the Mycological laboratory of Dr. Lee Bonar, who is technical adviser, or to Miss Elizabeth E. Morse, who is secretary, at the Botany Building, University Campus, Berkeley, California.

THE CARNEGIE LABORATORY AT STANFORD

There was dedicated at Stanford University, on Aug. 27, 1929, a group of buildings constituting the central laboratory in the western

United States of the Division of Plant Biology of the Carnegie Institution. The units that compose this group are planned for research in plant taxonomy, experimental plant-growing, and biochemistry, and consist of a main two-story laboratory and library building, a preparation house, and a greenhouse with adjacent transplant and culture gardens. In the future this laboratory will coordinate and centralize the more general aspects of biological research being conducted at the Desert Laboratory at Tucson, Arizona, the Coastal Laboratory at Carmel, California, and the Alpine Laboratory at Pike's Peak, Colorado, as well as a number of experimental bases throughout the western United States.—J. T. HOWELL.

NOTES AND NEWS

From April to August Professor W. A. Setchell of the University of California, was away from California as a delegate to the Fourth Pan-Pacific Congress held in Java in May and June, 1929.

Dr. Charles V. Piper, of the United States Department of Agriculture, died at Washington, D. C., February 11, 1926. His *Flora of the State of Washington*, published in 1906, was followed by a *Flora of Southeastern Washington* (1914) and a *Flora of the Northwest Coast* (1915). The two latter were produced in collaboration with R. Kent Beattie. Able and vigorous as a scientist, endowed with a strong personality and a fine presence, he was justly considered one of the most gifted men in the Bureau of Plant Industry.—W. L. J.

In *Science* (67: 447) an announcement of the determination of living ray and tracheid cells over 250 years old is made by Dr. D. T. McDougall and Mr. J. G. Brown.

Inez Mexia, botanical collector of the University of California, and Agnes Chase, of the Bureau of Plant Industry of the United States Department of Agriculture, left during October for extended field work in Brazil.

The following papers have been recently issued from the Department of Botany of Pomona College: The genus *Corethrogyne* in Southern California by Margaret L. Canby (*Bull. S. Cal. Acad. Sci.* 26:8-16—1927); Studies in Onagraceae, *Oenothera-Chylismia*, by P. A. Munz (*Am. Jour. Bot.* 15:223-240,—1928); Studies in Onagraceae, *Oenothera-Sphaerostigma* by P. A. Munz (*Bot. Gaz.* 85:223-240,—1928); The *Plantago patagonica* group of the United States and Canada by Ione Poe (*Bull. Torr. Club*, 55:406-420,—1928); A revision of the genus *Zauschneria* by Martha Hilend (*Am. Jour. Bot.* 16:56-68,—1929); A revision of the genus *Collinsia* by Vesta M. Newson (*Bot. Gaz.* 87:260-301,—1929).

The latest number (vol. 1, no. 3) of "Contributions from the Dudley Herbarium", Stanford University, establishes a new genus of Saxifragaceae, *Bensonia* (Abrams and Bacigalupi), from southwestern Oregon, contains a paper by Elmer I. Applegate on two new *Downingias* from southern Oregon, and another paper by Ira L. Wiggins describing four new plants from San Diego Co. The issue is dated May 20, 1929.

Two papers dealing with Pacific Coast fossil plant beds were published in 1927 by the Carnegie Institution. One on the "Geology and Paleontology of the Crooked River Basin" in Oregon is by Dr. Ralph W. Chaney. The other "Fossil Records of some West American Conifers" is by Mr. H. L. Mason.

A volume of 163 pages makes up the fifteenth number of "Contributions to Western Botany" by Marcus E. Jones. It was distributed from Claremont, California on June 6, 1929 and consists of botanical observations and criticisms, reviews of literature old and new, and miscellaneous field observations. It is a typical Jonesian contribution characterized by a pungent style, a type rarely met in these days but so abundantly present in numerous critiques of the old biological journal "Zoe".—J. T. H.

"The Role of the Structural Features of Pollen Grains in Identifying the most Important Hay Fever Plants of California" is the subject of a paper by George Piness M. D. and H. E. McMinn of Mills College in the "Journal of Laboratory and Clinical Medicine" (St. Louis, 1927).

The interesting marine angiosperm, Eel Grass (*Zostera marina* L.), found in shallow coastal lagoons and shoals along the California coast and elsewhere in temperate regions has been investigated ecologically and morphologically by Dr. W. A. Setchell of the University of California and the results of the studies have appeared in the two following contributions: *Zostera marina latifolia*—Ecad or Ecotype (Bull. Torr. Bot. Club 54: 1-6,—1927); Morphological and Phenological Notes on *Zostera marina* L. (U. C. Publ. Bot. 14: 389-452,—1929).

Contributions to our knowledge of the physiology and life histories of some California fungi have been made by Dr. Lee Bonar of the Department of Botany, University of California, in *Mycologia* 20: 292-300 (1928).

In the Botany of Ephedra in Relation to the Yield of Physiologically Active Substances by G. W. Groff and G. W. Clark (U. C. Publ. Bot. 14: 453-588,—1929), a taxonomic consideration of certain North

American species of the genus *Ephedra* precedes an account of the physiological effects of medical substances derived from plants of the genus.

Preliminary to a complete treatment of the Red Algae of the Pacific Coast of North America, Dr. N. L. Gardner has four contributions on New Rhodophyceae in U. C. Publ. Bot. vols. 13 and 14. Other recently published researches in the morphology and taxonomy of Pacific Coast algae include: Drew, K. M. A Revision of the Genera *Chantransia*, *Rhodochorton*, and *Acrochaetium*, with Descriptions of the Marine Species of *Rhodochorton* on the Pacific Coast of North America (U. C. Publ. Bot. 14: 139-224,—1928); Myers, M. E. The Life-History of the Brown Alga, *Egregia Menziesii* (U. C. Publ. Bot. 14: 225-246,—1928); Setchell, W. A. The Genus *Microdictyon* (U. C. Publ. Bot. 14: 453-588,—1929).

Two contributions to our knowledge of the exotic flora of California have come recently from the Department of Botany of the California Academy of Sciences in San Francisco. In the *Escallonias* in Golden Gate Park, with Descriptions of New Species (Proc. Cal. Acad. Sc. 4th ser. 18: 385-391,—1929), Alice Eastwood describes the distinguishing characters of most of the species commonly cultivated, not only in the Golden Gate Park, but rather generally throughout California. Eric Walther's Key to the Species of *Eucalyptus* Grown in California (Proc. Cal. Acad. Sc. 4th ser. 17: 67-87,—1928) is a contribution to a more ample knowledge of the taxonomy of this genus so widely and extensively cultivated in California.

In an account entitled Studies in the Flora of Lower California and Adjacent Islands (Proc. Cal. Acad. Sc. 4th ser. 18: 393-484,—1929), Alice Eastwood reviews the botanical exploration of the islands off Lower California and of several localities on the mainland, and gives the names of species that have been reported for each. This report will form a basis for further studies of these southern areas that are closely related botanically to our own California flora.

Three new species of *Ceanothus*, two species from California and one from Utah, have been described by Alice Eastwood (Proc. Cal. Acad. Sc. 4th ser. 16: 361-363,—1927). One of the California species, *C. cyaneus*, is found in the mountains of San Diego Co. while the other, *C. insularis*, comes from Santa Cruz Island.

An article on Certain Fossil Cones from the Pacific Coast by F. M. Scott of the University of California at Los Angeles (Bull. Torr. Bot. Club 54: 7-11,—1927) describes coniferous material from various stations on the Pacific Coast of North America.

A Preliminary Report on the Flora of the Charleston Mountains of Nevada by Edmund C. Jaeger, recently published at the River-

side Junior College, is of interest to California botanists because of the close relationships between the flora of the Charleston Mountains and of the high desert ranges of eastern and southern California.

The genus *Haplopappus* is the title of a Carnegie Institution Publication, no. 389 (Washington, 1928, pp. 1-391), by Dr. H. M. Hall. This paper is an intensive and thoroughgoing study of a group that has a large representation in western America. There are 114 figures and 16 plates.

"A Systematic Study of the genus *Lessingia* Cham." has been completed by John Thomas Howell (Univ. Cal. Publ. Bot. 16:1-44, figs. 1-70,—1929). The author recognizes seven species and a considerable number of varieties, of which three are new. For specific criteria reliance has been placed chiefly on gland character, structure of style branches and habit. The author considers that the Tehachapi region represents the geographic center of the genus.

A REVISION OF CALIFORNIAN UMBELLIFERAE.—V.

WILLIS LINN JEPSON

(Concluded from page 162)

1 or 2, linear-acuminate; fruit broadly oblong, slightly pubescent, 3 to 4 lines long; lateral wings thick and corky, as broad as the body; oil-tubes solitary in the intervals; seed deeply sulcate beneath the oil-tubes.—Along the coast, mostly on or near the sea-bluffs, 5 to 200 ft.: San Mateo Co. to Humboldt Co. North to Wash.

Locs.—Pt. Lobos, San Francisco, (Fl. W. Mid. Cal. 356); Pt. Reyes, *Davy* 6869; Newport, Mendocino Co., *Jepson* 13,487; Loleta, Humboldt Co., *Jepson* 2133.

Refs.—ANGELICA HENDERSONI C. & R. Bot. Gaz. 13: 80 (1888), type loc. Long Beach, Ilwaco, Wash., *Henderson* 2158; *Jepson*, *Man.* 727, fig. 711 (1925).

2. *A. tomentosa* Wats. Stout, 2 to 5 ft. high, the stems and especially the leaves puberulent, or sometimes nearly glabrous; leaves bipinnate or ternate or quinate and then pinnate; leaflets ovate, acute, acutish or often long-pointed, sometimes varying to lanceolate or roundish, irregularly serrate, obliquely 2-lobed, or not lobed and merely oblique, $1\frac{1}{2}$ to 3 (or 6) in. long; petioles strongly dilated at base; fruiting rays 1 to 5 in. long; fruiting pedicels 2 to 3 lines long; ovary tomentulose; fruit oblong or elliptic, glabrous, 3 to $4\frac{1}{2}$ lines long; dorsal and intermediate ribs small and acutish; lateral wings nearly equaling the body in breadth; oil-tubes 1 in the intervals, or sometimes 2 in the lateral intervals, mostly 2 on the commissure; seed somewhat sulcate beneath the oil-tubes.—Dry woods, 300 to 4000 ft.: coastal S. Cal.; n. through the Coast Ranges to Humboldt Co.

Locs.—French Valley, Palomar Mt.; Mt. San Jacinto (Univ. Cal. Publ. Bot. 1:98); San Bernardino Mts. (Pl. World 20: 247); West Fork Cucamonga Cañon, San Gabriel Mts.; Big Pine Mt., Santa Barbara Co., *J. R. Hall*; Berkeley, *H. A. Walker*; Mt. Tamalpais, *Jepson*; St. Helena, *Jepson* 13,483; Calistoga, *Jepson* 13,484; Peanut, Trinity Co., *J. W. Patton*; Eureka, *Tracy* 6902; Alton, Humboldt Co., *Tracy* 6560.

Var. CALIFORNICA *Jepson*. Rays very unequal ($1\frac{1}{4}$ to $5\frac{3}{4}$ in. long), scaberulous at the ends; oil-tubes 2 (or 3) in the intervals, mostly 4 in lateral pairs on the commissure.—Vaca Mts.

Refs.—ANGELICA TOMENTOSA Wats. Proc. Am. Acad. 11:141 (1876), type loc. San Francisco; *Jepson*, *Man.* 728 (1925). Var. *elata* *Jepson*, Fl. W. Mid. Cal. 356

(1901), type loc. Napa Valley, *Jepson*. Var. CALIFORNICA Jepson Fl. W. Mid. Cal. 356 (1901). *A. californica* Jepson, *Erythra* 1:8 (1893), type loc. Gates Cañon, Vaca Mts., *Jepson*.

3. *A. breweri* Gray. Stems 3 to 5 ft. high; herbage glabrous; leaves ternate, or quinate, then pinnate; leaflets lanceolate to oblong or occasionally ovate-lanceolate, acuminate, sharply serrate, $1\frac{1}{2}$ to 4 in. long; rays many, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long in fruit; pedicels 2 to $3\frac{1}{2}$ lines long; rays and pedicels not "web-footed" or very obscurely so; pedicels and ovaries whitish-puberulent; fruit oblong or somewhat narrowed below, pubescent or becoming glabrous, 3 to $4\frac{1}{2}$ lines long; dorsal and intermediate ribs more or less prominent; lateral wings as wide as the body; oil-tubes 1 or 2 in the intervals.—Dry wooded slopes or flats, 3000 to 8000 ft.: Sierra Nevada from Mariposa Co. to Tehama Co. East to western Nev.

Locs.—Chilnualna Falls, Mariposa Co., *Congdon*; Hetch-Hetchy, *Jepson* 3451; Dorrington, Calaveras Co., *A. L. Grant* 591; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 445; Bear Valley, Nevada Co., *Jepson* 13,486; Bowman Lake, Nevada Co., *A. M. Carpenter*; Rich Point, Middle Fork Feather River, *Jepson* 10,610; Manzanita Lake, e. Tehama Co., *Jepson* 15,330.

Refs.—ANGELICA BREWERI Gray, Proc. Am. Acad. 7:348 (1868), type loc. Ebbetts Pass, Alpine Co., *Brewer*; *Jepson*, Man. 728 (1925).

4. *A. lyallii* Wats. Plants 2 to 4 ft. high; herbage and inflorescence glabrous; leaves biternate, then pinnate; leaflets ovate-lanceolate, serrate, $1\frac{1}{2}$ to $3\frac{1}{2}$ or 5 in. long; fruiting rays $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long, the outer row somewhat coalescent at base so as to be web-footed; outer row of pedicels similarly coalescent; fruit broadly oblong to obovate, 3 to $3\frac{1}{2}$ lines long; dorsal and intermediate ribs sharply salient, equal; lateral wings about as broad as the body; oil-tubes solitary in the intervals.—Siskiyou Co. North to Alberta.

Refs.—ANGELICA LYALLII Wats. Proc. Am. Acad. 17:374 (1882), type loc. "Galton and Cascade Mountains", n. Wash., *Lyall*; *Jepson*, Man. 728 (1925).

5. *A. lineariloba* Gray. Stout, glabrous, 2 to 3 ft. high; leaves 2 or 3 times ternate, then pinnate with about 5 (3 to 9) leaflets; leaflets linear or linear-lanceolate, 1 to 3 in. long, 1 to 2 lines wide, entire or often with a pair of coarse teeth towards the base, frequently decurrent on the rachis; fruiting rays 1 to 2 or $3\frac{3}{4}$ in. long; involucre and involucels none; fruit oval-oblong, glabrous, 4 to 6 lines long; dorsal and intermediate ribs filiform; lateral wings thickish, a little narrower than the body; oil-tubes solitary in the dorsal intervals, in pairs in the laterals.—Montane slopes, dry soil, 6400 to 9500 ft.: Sierra Nevada from Mariposa Co. to Tulare Co.

Locs.—Farewell Gap *Jepson* 1140; Mineral King, *Jepson* 1155; Kern Cañon, Tulare Co., *Jepson* 968; Bubbs Creek, *Jepson* 791.

Var. CULBERTSONII *Jepson*. Leaf-segments 4 to $4\frac{1}{2}$ lines wide.—Little Kern River.

Refs.—ANGELICA LINEARILOBA Gray, Proc. Am. Acad. 7:347 (1868), type loc. Ostranders Mdws., Yosemite, *Bolander*; *Jepson*, Man. 728 (1925). Var. CULBERTSONII *Jepson* l. c., type loc. Little Kern River, *Culbertson* 4276.

37. COELOPLEURUM Ledeb.

Very stout perennial herb of the sea-coast with glabrous herbage. Leaves uni-, bi- or tri-ternate, with large inflated petioles. Flowers greenish-white, in many-rayed umbels. Involucre of few narrow bracts, sometimes foliaceous. Involucel of many linear-lanceolate bractlets. Fruit elliptic-oblong, not flattened dorsally. Ribs very thick and corky, becoming hollow, equal or the lateral ones a little broader. Oil-tubes small, 1 in the intervals, 1 or 2 under each rib, 2 to 4 on the commissure. (Greek koilos, hollow, and pleuron, rib, referring to the cavity made by the intruded ribs.)

1. *C. maritimum* C. & R. Stems cormybosely branched, 2 to 3 ft. high; leaflets roundish to ovate, crenate, $1\frac{1}{4}$ to 4 in. long; rays 1 to $1\frac{3}{4}$ in. long; fruits $2\frac{1}{2}$ to 3 lines long, the lateral ribs twice as broad as the others.—Salt

marshes or low ground along the coast, 5 to 500 ft.: central Humboldt Co. North to Wash.

Locs.—Loleta, *John Mathiesen*; Hookton, Humboldt Bay, *Tracy* 4581.

Refs.—COELOPLEURUM MARITIMUM C. & R. Bot. Gaz. 13:145 (1888), type loc. Long Beach, Ilwaco, Wash., *Henderson* 384. *C. lucidum* Jepson, Man. 728 (1925). The proper name for this plant of our north coast is, to us, uncertain at this time and the problem must be deferred for further investigation.

38. SPHENOSCIADIUM Gray

Perennials with thick roots. Stems stout, tall, nearly simple, glabrous. Leaves once or twice pinnate with bladdery dilated petioles. Flowers white (or sometimes purplish), sessile on enlarged receptacles and forming compact heads, the heads borne on tomentose rays in a medium-sized umbel. Involucre none. Involucels of many linear-setaceous bractlets. Calyx-teeth none. Fruit cuneate-obovate, flattened, subglabrous. Ribs prominent, winged above, the dorsal and intermediate ones narrow, the lateral broader. Oil-tubes solitary in the intervals, 2 on the commissure. Seed face plane. (Greek sphenos, a wedge and sciadios, an umbrella, referring to the umbel.)

1. *S. capitellatum* Gray. Fig. 712. Stems very stout, 3 to 8 ft. high; leaves large, glabrous or puberulent; leaflets or segments linear-lanceolate to oblong or oblong-ovate, serrate or coarsely and saliently few-toothed above, more or less entire below; rays 4 to 8 (or 14), subequal, 1 to 2 (or 4) in. long; flowers pubescent; involucels of a few deciduous bractlets; fruit cuneate-obovate, 3 lines long.—Montane, along streams or borders of meadows, 3500 to 10,000 ft.: San Bernardino Mts.; White Mts.; Sierra Nevada from Kern Co. to Modoc Co., thence w. to Siskiyou Co. East to western Nevada; s. to San Pedro Martin in Lower California; n. to eastern Oregon and to Idaho. July-Oct.

Locs.—Bluff Lake, San Bernardino Mts., *Parish*; Bitter Creek, Mt. Pinos; Bisses sta., Tehachapi Mts., *W. R. Dudley*; Mt. Silliman; Bench Mdw., Kaiser Ridge, *Jepson* 13,275; Line Creek, Huntington Lake, *Jepson* 13,096; Red Mdw., near Devils Post-pile, Madera Co., *A. L. Grant* 1563a; Hetch-Hetchy, *Jepson* 3484; Soda Springs Cañon, Kennedy Lake, Tuolumne Co., *A. L. Grant* 504; Poison Creek, White Mts., *Jepson* 7373; Barrette Camp, Tells Peak, Eldorado Co., *Kennedy* 79; Donner Lake, *Sonne*; Susanville, *Pearl Safford*; Mill Creek, Warner Mts., *L. S. Smith* 998; Shasta Sprs., *Jepson* 13,482; Shackelford Creek, w. Siskiyou Co., *Butler* 460; Asa Bean Flat, ne. Mendocino Co., *Cronemiller*.

Three varieties are recognized in the Manual of the Flowering Plants of California, var. *scabrum* Jepson (leaves typically scaberulous), var. *validum* Jepson (leaf segments ovate) and var. *eryngiifolium* Jepson (leaves glabrous or tending to be). All need further study but the first two are probably of little moment. The third, var. *eryngiifolium*, is fully connected by a series of intergrades with the species. The type of *Selinum eryngiifolium* Greene represents a dwarfed and probably much starved state most likely growing on granite. The original, collected July 12, 1889 by Drew (really by Chesnut and Drew), is from the granite dome, Cloud's Rest, above Yosemite. The ovate-acute spinulose-tipped leaf-segments are only 1 to 1½ lines long, the segments and pinnæ noticeably divaricate. Every intergrade between this state and a more usual or normal form with narrowly linear or lanceolate segments 1½ to 10 lines long is represented in the higher Sierra Nevada and on its eastern slope: Upper Funston Mdws., Kern Cañon; Minarets, Madera Co., *Congdon*; Crescent Lake, Mariposa Co., *Congdon*. This latter state with linear leaf-segments, in turn, intergrades to the usual form of the Sierra Nevada.

Refs.—SPHENOSCIADIUM CAPITELLATUM Gray, Proc. Am. Acad. 6:537 (1865), type loc. Ebbetts Pass, *Brewer*; Jepson, Man. 729, fig. 712 (1925). Var. *scabrum* Jepson l. c. Var. *validum* Jepson, l. c. *S. validum* Congdon, Erythra 7:185 (1900), type loc. Wawona, *Congdon*. Var. *eryngiifolium* Jepson l. c. | *Selinum eryngiifolium* Greene, Pitt. 2:102 (1890), type loc. above Yosemite, *Drew*. | *Sphenosciadium eryngiifolium* C. & R. Contrib. U. S. Nat. Herb. 7:128 (1900). *Selinum capitellatum* B. & W. Bot. Cal. 1:265 (1876).

39. CYMPTERUS Raf.

Perennial herbs with basal leaves. Herbage glabrous (except in no. 6). Leaves usually ternate, then once to thrice pinnate and much dissected or incised. Involucre usually lacking. Involucels always present. Flowers yellow, white or purple, in compound umbels. Calyx-teeth usually evident. Fruit oblong to orbicular, mostly dorsally flattened, the carpels 3 to 5-winged. Stylopodium wanting. Oil-tubes several in the intervals, 2 to many on the commissure. Seed

flat to very slightly or not at all dorsally flattened. (Greek kuma, wave, and pteron, wing, the ribs in some species with undulate wings.)

Wings of carpels thin, undulate-cripsed (except in the var.); tall plants; Sierra Nevada and mts. of n. Cal.1. *C. terebinthinus*.

Wings of carpels commonly thickened or corky at insertion, sometimes corky throughout.

Small plants of the deserts and desert slopes of mountain ranges.

Flowers in umbels; wings of carpels entire.

Leaves light green, the ultimate segments lanceolate or oblong, 1 to 2 lines long; involucre none or of a few small bracts....2. *C. panamintensis*.

Leaves grayish, the ultimate divisions ovate, 4 to 6 lines long; crenate or incised; involucre very conspicuous.....3. *C. utahensis*.

Flowers in dense globose heads.

Wings of carpels with shredded margins; foliage glabrous....4. *C. deserticola*.

Wings of carpels entire; foliage minutely pubescent.....5. *C. cinerarius*.

Low plants of sandy sea-shores; umbellets capitate.....6. *C. littoralis*

1. *C. terebinthinus* (Hook.) T. & G. Plants $\frac{1}{2}$ to $1\frac{1}{2}$ ft. high, the leaves all basal; peduncles about twice as long as the leaves, arising from the shortly branched caudex which is clothed with persistent leaf sheaths; leaves 2 to 6 in. long, on petioles about as long, usually ternate, then 1 to 3 times pinnate and pinnately dissected into short linear segments about 1 line long; umbels with unequal rays, no involucre and involucels of linear acuminate bractlets; flowers yellow; fruiting rays 1 to 3 in. long; fruiting pedicels 3 to 5 lines long; fruit broadly oblong to nearly orbicular, 4 to 6 lines long; carpels with 3 to 5 broad thin undulate crisped wings, or one carpel with broad wings (especially the lateral wings) and the companion carpel with wings narrow and much reduced; oil-tubes very small, 4 to 9 in the intervals, 8 to 16 (or 20) on the commissure side.—Montane, in dry granite soil, 5000 to 9000 ft.: Sierra Nevada from Tulare Co. to Lassen Co. North to Wash.

Locs.—North Fork Middle Tule River, *Jepson* 4688; Putnam Cañon, Tulare Co., *Walter Fry* 335; Bubbs Creek, *Jepson* 794; Huntington Lake, *A. L. Grant* 1137, 1170; Jackass Mdw., Fresno Co., *E. V. Ferguson* 437; Dana Fork, Tuolumne River, *Jepson* 3264; Muir Gorge to Table Lake, Tuolumne River, *Jepson* 3390; Rancheria Mt., Tuolumne Co., *Jepson* 4597; Kennedy Lake, Tuolumne Co., *A. L. Grant* 248; Barrette Camp, 3 mi. s. of Tells Peak, Eldorado Co., *Kennedy* 106; Echo Lake near Fallen Leaf, *Ottley* 1185.

Plants from high altitudes (9700 to 11,000 ft.) resemble closely the prevailing form of *C. terebinthinus* but are much reduced ($\frac{1}{2}$ to 4 in. high) with the root crown very densely clothed with old leaf bases and the umbellets without bractlets. This state may be *C. foeniculaceus* T. & G., a plant of the Blue Mts. of Oregon. Our material is only in flower, namely: Muir Pass, *E. Ferguson* 493; Mary Lake near Tower Peak, *Jepson* 4555.

Var. CALIFORNICUS *Jepson*. Wings of carpels not undulate-cripsed; leaves with ultimate divisions ovate to almost linear; involucels of small linear bractlets; fruit oblong, 3 to 4 lines long; intermediate and dorsal wings sometimes reduced in breadth; oil-tubes 3 to 5 in the intervals, 6 on the commissure.—N. Sierra Nevada, 1500 to 5000 ft., from Nevada Co. to Lassen Co., thence w. to Siskiyou Co.

Locs.—Sisson, *Jepson* 13,488; Forks of Salmon to Cecilville, *Jepson* 2080.

Refs.—CYMPTERUS TERBINTHINUS T. & G. Fl. 1:624 (1840); *Jepson*, Man. 730, fig. 713 (1925). *Selinum terebinthinum* Hook. Fl. Bor. Am. 1:266, t. 95 (1834). *Pteryxia terebinthina* C. & R. Contrib. U. S. Nat. Herb. 7:171 (1900). Var. CALIFORNICUS *Jepson*, Man. 730 (1925). *Pteryxia californica* C. & R. Contrib. U. S. Nat. Herb. 7:172 (1900), type loc. Sisson, Siskiyou Co., *H. E. Brown*.

2. *C. panamintensis* C. & R. Plants low (3 to 10 in. high); peduncles purplish, arising from a short caudex sheathed with old leaf bases; leaves 2 to $2\frac{3}{4}$ in. long, on petioles about as long, ternate, then once or twice pinnate, the pinnae finely dissected; ultimate segments 1 to $1\frac{1}{2}$ lines long, tipped with a slender bristle-like apiculation; rays in fruit 1 to $1\frac{1}{2}$ in. long; pedicels short; involucre none; involucels small, gamophyllous, somewhat one-sided, purplish, cleft into ovate acuminate segments; flowers greenish-yellow; fruit $4\frac{1}{2}$ lines long, glabrous, each carpel with 5 broad wings, the wings very thick at insertion; oil-tubes 3 or 4 in the intervals, 4 or 5 on the commissure; seed face deeply concave.—Dry rocky cañon sides, 5000 to 6000 ft.: e. Mohave Desert; Death Valley region.

Locs.—Hanaupah Cañon, Panamint Mts., *Jepson* 6991; Argus Mts. (Contrib. U. S. Nat. Herb. 7: 177).

Refs.—CYMPTERUS PANAMINTENSIS C. & R. Contrib. U. S. Nat. Herb. 4: 116 (1893), type loc. Johnson Cañon, Panamint Mts., *Coville* 508; *Jepson*, Man. 730 (1925). *Aulospermum panamintense* C. & R. Contrib. U. S. Nat. Herb. 7:177 (1900). Var. *acutifolium* C. & R. l. c., type loc Newberry Sprs., *Lemmon*.

3. *C. utahensis* Jones. Plants 3 to 5 in. high, the peduncles equaling or exceeding the leaves; leaves gray-pallid, ternate, then bipinnatifid; ultimate segments ovate in outline, 4 to 6 lines long, crenate or incised; umbels more or less compacted; involucre of conspicuous hyaline bracts with prominent green or purplish nerves; involucels resembling the involucre; flowers purple; fruit orbicular, 4 to 6 lines long, its body oblong; ribs with broad membranous wings (often corky-thickened next the body of the carpel); carpels flattened with 5 broad thin wings; oil-tubes 2 in the intervals, 4 on the commissure.—E. Mohave Desert. East to Utah and N. Mex.

Refs.—CYMPTERUS UTAHENSIS Jones, Proc. Cal. Acad. ser. 2, 5:684 (1895), type loc. Paguma, Ariz., *Jones* 5098; *Jepson*, Man. 730 (1925).

4. *C. deserticola* Bdg. Plants 4 to 6 in. high, the peduncles and leaves rising from among the old petioles of the root-crown, peduncles ascending a little exceeding the leaves; leaves glabrous, triangular in outline, 2 in. long, bi- or tri-ternate, then pinnately parted; segments with acute bristle-tipped lobes; petioles $2\frac{1}{2}$ to $3\frac{1}{2}$ in. long; involucre with short linear bracts; flowers dark purple, crowded in a globose head $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter; fruits 2 lines long, sessile; lateral wings thick, corky, narrow, pubescent, with the margins shredded; oil-tubes minute and numerous, forming a continuous chain.—Dry plains or flats, 2000 to 3000 ft.: central Mohave Desert.

Loc.—Betw. Victorville and Rabbit Sprs., *Parish* 9742.

Refs.—CYMPTERUS DESERTICOLA Bdg., Univ. Cal. Publ. Bot. 6:168 (1915), type loc. Kramer, Mohave Desert, *K. Brandegee*; *Jepson*, Man. 731 (1925).

5. *C. cinerarius* Gray. Plants 2 in. high, the peduncles and leaves from a short more or less horizontal subterranean caudex; leaves (in outline) somewhat cordate, bipinnate, with pinnately divided segments, glaucous and cinereous with a very minute harsh pubescence; rays few, short or almost none; involucels of numerous united somewhat membranous long-acuminate segments; flowers purplish; fruit $2\frac{1}{2}$ lines long, the 5 wings of each carpel rather narrow and thick at insertion; oil-tubes 3 in the intervals, several on the commissure; seed face with narrow and deep concavity.—Granite slopes, 8,000 to 9,000 ft.: e. slope of the Sierra Nevada in the Mono Lake region; White Mts., Inyo Co.

Refs.—CYMPTERUS CINERARIUS Gray, Proc. Am. 6:535 (1865), type loc. Sonora Pass, *Brewer*; *Jepson*, Man. 731 (1925). *Aulospermum cinerarium* C. & R. Contrib. U. S. Nat. Herb. 7:178 (1900).

6. *C. littoralis* Gray. Peduncles and leaves spreading or prostrate peduncles and leaves arising from very short stems; leaves simply ternate, longer than the peduncles, densely white-tomentose beneath; petioles 2 to 4 in. long; leaflets ovate or roundish in outline, 1 to $2\frac{1}{2}$ in. long, either the terminal or lateral or all 3 leaflets often 3-parted or -divided, their margins callous-serrate or -dentate; umbel compact, hemispherical, resting on the sand; rays $\frac{3}{4}$ to $1\frac{1}{4}$ in. long; umbellets capitate; flowers white, bracts and bractlets subulate; fruit dorsally flattened, each carpel bearing 5 equal broad corky wings $1\frac{1}{2}$ to 2 lines wide, the fruit therefore subglobose in outline, 4 to 5 lines in diameter; oil-tubes 2 or 3 in the intervals, 4 or 6 on the commissure; seed face somewhat concave.—Sandy sea-beaches: Mendocino Co. to Del Norte Co. North to Alas.

Refs.—CYMPTERUS LITTORALIS Gray, Pac. R. Rep. 12: 62 (1860), type loc. Shoalwater Bay, Puget Sound, *J. G. Cooper*; *Jepson*, Man. 731 (1925). *Glenhnia littoralis* F. Schmidt, Ann. Mus. Bot. Lugd. Bat. 3:61 (1867). *Phellopterus littoralis* F. Schmidt, Mem. Acad. Petrop. ser. 7, 12:138 (1868).

Errata

Page 5. Fig. 1 should read *Arctostaphylos glandulosa* Eastw.

Page 7. Fig. 2 should read *Arctostaphylos glandulosa* Eastw.

Page 8. Fig. 3 should read *Arctostaphylos nummularia* Gray.

Page 9. Fig. 4 should read *Arctostaphylos nummularia* Gray.

Page 10. Fig. 5 should read *Arctoostaphylos nummularia* Gray.

Pages 99, 100, 101 and 102 of the number 6 (March 1923) issue should be corrected so as to read 99a, 100a, 101a and 102a respectively.

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