II.

CONTRIBUTIONS TO THE BOTANY OF NORTH AMERICA.

(*Continued from Vol. IX., p.* 218.)

By Asa Gray.

Presented, May 12 and Oct. 13, 1874.

I. *A Synopsis of the North American Thistles.*

CNICUS Linn., Schreber, Benth. & Hook.

(Cirsium Tourn., DC.)

1. *Species Inquilinæ.*

C. lanceolatus Hoffm. Folia decurrentia, superne setoso-aspera.
C. arvensis Hoffm. Capitula subdioica, parva.

2. *Species Indigenæ.*

§ 1. Involucrum gradatim imbricatum; squamis adpressis, exterioribus sensim brevioribus, omnibus nec herbaceo- nec scarioso-appendiculatis, intimis in paucis appendice parva scariosa superatis.

* Folia viridia seu araneoso-lanata (nunquam tomento denso albo-lanuginosa): caules sæpius abbreviati vel simplices: involucri squamæ laxiusculæ, planæ, subchartaceæ, exteriores mucrone vel spinula nec valido nec patente superatæ: antherarum appendices acuminatæ vel cuspidatæ.

+ Atlantici; capitulis mediocribus angustioribus; pedunculis nudis.

C. repandus Ell. *Cirsium repandum* Michx. Humilis, involucro campanulato.

C. Lecontei. *Cirsium Lecontei* Torr. & Gray, Fl. 2, p. 459. Elatior, involucro oblongo vel cylindraceo.

+ + Atlantici; capitulis majoribus latis bracteis spinosis nunc stipatis.

hairs; the terminal prickle weak. Subtending bracts spiny-ciliate, the inner passing into the involucral scales.

C. CARLINOIDES Schrank, var. AMERICANUS. — Rocky Mountains of Colorado Territory, Hall and Harbour (no. 342), E. L. Greene; Western part of California, Samuels, Bolander: forms with short and broad scarious and lacerate appendages to most of the scales of the involucre, tipped with an extremely short prickle, and few or no prickly-fringed subtending bracts. Also, Mendocino Co., California, Kellogg, a form with exterior involucral scales hardly at all appendaged, and the inner with rather small acuminate appendage, — possibly a hybrid with *C. remotifolius*. This, or a form like it, appears to be *Cirsium scariosum* Nutt. in Trans. Amer. Phil. Soc. l. c. p. 420, from the plains of the Rocky Mountains, — which was accidentally omitted from the Flora of North America.

II. *Notes on Borraginaceæ.*

COLDENIA Linn. Upon a revision of the plants of this group, I am the more convinced that the genus *Coldenia* should have the extension which I proposed in Proc. Am. Acad. 5, p. 340, and should include *Ptilocalyx* Torr. also. And it is pleasant to note that a genus which was dedicated to one of our worthies of the colonial period, has proved to be mainly American, although founded on an Indian plant. The section which I proposed, under the name of *Tiquiliopsis*, if strengthened on the one hand by a second species (*C. Palmeri* Gray, Proc. Am. Acad. 8, p. 136) as respects the corolline appendages, is invalidated on the other by the discovery that its embryo does not accord with that of *T. Nuttallii*; but it is still unlike that of *Tiquilia*. Mr. Watson, in redescribing the *T. Palmeri* (in Bot. King, p. 247), states that the tube of the corolla is "without scales at the base." There are not, indeed, such free scales as those of *T. Nuttallii*, but in their stead are much longer and salient plicæ, reaching up to the insertion of the slender filaments. The fruit, which Mr. Watson first made known, he describes as of "a single obovate-globose smooth nutlet, attached at the base, and without ventral sulcus." There are often two such nutlets matured; but the rounded scar is ventral, not basal, yet very different from that of *T. Nuttallii*. Of albumen there is barely a trace. The character "cotyledons rounded, flat, entire, incumbent upon the shorter radicle," is correct, except that they are rather hemispherical than flat. This turning up of the rather long radicle upon the back

of one of the thick cotyledons is most peculiar and remarkable, and is strikingly in contrast with the deeply hippocrepiform cotyledons of *T. Nuttallii*, surrounding the radicle, as represented in Dr. Torrey's plate. I am disposed to keep up the section *Tiquiliopsis* for these two species with anomalous embryos and appendaged corolla-tube.

HELIOTROPIEÆ Fresenius. The proper stigma in *Heliotropium* and *Tournefortia*, occupying the margin of an annular or peltate disk, and surmounted by an appendage which has generally been taken for stigma, recalls the similar structure in *Apocynaceæ*.

HELIOTROPIUM Tourn.* If three genera are to be admitted in the

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* The North American species as now known are: —

§ 1. EUPLOCA. Vide supra.

H. CONVOLVULACEUM Gray, l. c.

§ 2. EUHELIOTROPIUM. *Heliotropium* & *Schleidenia* (Endl.) Fresenius.

* *Orthostachys* R. Br. (*Preslæa* Mart.). *Schleidenia* Endl., Fresenius.

+ Appendix stigmatis elongata, subulata. Folia angusto-linearia.

H. GREGGII Torr. Bot. Mex. Bound. p. 137. Corolla limbo amplo: stylus brevissimus.

H. ANGUSTIFOLIUM Torr. l. c. Corolla lobis ovato-lanceolatis: stylus gracilis.

H. TENELLUM Torr. l. c. Calyx inæqualis: stylus perbrevis.

+ + Appendix stigmatis brevis conica.

H. LIMBATUM Benth., var. CONFERTIFOLIUM Torr. Bot. Mex. Bound. Hartweg's plant, on which *H. limbatum* was founded, has the aspect rather of *H. hispidum* than of Torrey's plant of our Mexican border, collected by Berlandier, Gregg, Wright, &c. But Coulter's no. 1051, and corresponding specimens by Dr. Edwards, &c., are intermediate. This var. *confertifolium* Torr. is very like *H. microphyllum* Swartz., as represented by Wright's Cuban no. 3139. This, however, has a much smaller corolla and a shorter style; and *H. imbricatum* Griseb. would seem to be a form of it.

H. POLYPHYLLUM Lehm. Asper. & Ic. t. 8. *H. glomeratum* A. DC? *H. bursiferum* C. Wright in Griseb. Cat. Cub. p. 211. Florida, Buckley, &c.

Var. LEAVENWORTHII (*H. Leavenworthii* Torr. herb.) is a strict and slender-leaved form; but specimens recently collected by Dr. Edward Palmer, in the same part of Florida where Dr. Leavenworth collected it, seem to have golden-yellow flowers!

H. PHYLLOSTACHYUM Torr. l. c. 1859. *H. myosotoides* Chapm. Fl. p. 330, 1860. Berlandier's numbers 1538, 3038, referred to this species by Dr. Torrey, are more probably depauperate states of *H. hispidum* HBK.

* * Flores ebracteati in spicis scorpioideis sæpius conjugatis vel 1–2-furcatis: antheræ liberæ.

H. EUROPÆUM Linn. Stigma appendice tenuiter subulata superatum. Naturalized southward.

manner and upon the characters proposed by Fresenius in the Flora Brasiliensis, Nuttall's name of *Euploca* would by right of priority take the place of *Schleidenia*. But, in retaining the comprehensive *Heliotropium* of Linnæus (*Piptoclaina* of Don perhaps separated), I prefer to include *Schleidenia*, and also Bentham's section *Platygyne*, in *Euheliotropium*, and to make of *Euploca* a primary section. It is characterized by the long filiform style, strongly penicillate appendage to the stigma, and didymous fruit, which separates promptly into four almost hemispherical half-carpels. The corolla is unusually large for the genus. Many years ago we had the plant in cultivation, and thought it very ornamental. It is desirable, and it ought not to be very difficult, to obtain it again. The pure white blossoms are open not merely at sunset, but also (according to my memorandum) for nearly the whole day. The name of *H. convolvulaceum* was applied to it in the Mem. Am. Acad. 6, p. 403, 1859. There is an equally slender style in Grisebach's *H. serpylloides* of the West Indies, and the cone surmounting the stigma is occasionally bearded in other species.

H. parciflorum of Griseb. Cat. Pl. Cub., and mentioned in the Flora of British West Indies, cannot be the *Preslæa parciflora* of Martius (*Schleidenia* Fresen.), for it has a strongly beaked fruit. It is perhaps merely a form of *H. humistratum* Cham.

H. fruticosum Linn., described by Grisebach as having "stigma as long as the style," has (even in a specimen named by and received from him) a style several times longer than the stigma and its tip.

Heliophytum molle Torr. Bot. Mex. Bound. p. 138, with globose, not at all didymous, and when fresh probably more or less drupaceous fruit, I refer to *Tournefortia* = *T. mollis*.

LITHOSPERMUM Tourn. Characters from the insertion of the stamens and length of the style should be suspected; for the tendency to

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H. INUNDATUM Swartz. Stigma cono obtuso capitatum.

H. CURASSAVICUM Linn. Stigma umbraculiforme, cono obsoleto.

§ 3. TIARIDIUM (Lehm. *Heliophytum* DC.)

* Fructus didymus, nuculis parallelis.

H. PARVIFLORUM Linn. Keys of Florida and along the southern borders of Texas.

H. GLABRIUSCULUM. *Heliophytum glabriusculum* Torr. l. c. South-western borders of Texas.

* * Fructus mitræformis. — *Tiaridium* Lehm.

H. INDICUM Linn. Naturalized in Southern Atlantic States.

dimorphism, which is obvious in the *Batschia* section (although not demonstrated in all of the species), may pervade the genus.*

MERTENSIA Roth. A new study of this genus enables me to make a few corrections to my paper on the American species, pub-

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* Our North American *Lithosperma* of the *Batschia* section may be characterized thus.

1. Corolla ut videtur pallide flava: folia floralia minora, calyces fructiferos haud superantia.

L. MULTIFLORUM Torr. in herb.; S. Wats. Bot. King (adnot.), p. 238. *L. pilosum* Gray in Sill. Jour. 34, p. 256, & in Proc. Acad. Philad. 1863, non Nutt. — Colorado in the lower mountains to New Mexico and Texas. The throat of the corolla is nearly naked. Nuttall's *L. pilosum* is the same as *L. ruderale* Dougl. & Hooker. I was misled into taking this species for it through Nuttall's reference of his to *Batschia*, and his idea that the corolla was yellow, whereas in that species it is only yellowish in the manner of *L. officinale*.

2. Corolla aurea vel aurantiaca: folia floralia pleraque conformia, calyces superantia,

+ Oblonga vel ovata: corolla nec tubo prælongo, nec plicis faucialibus fornicato-inflexis.

L. CALIFORNICUM. Pube molli hirsutum; foliis lanceolatis; corolla flava, tubo calyce sesquilongiore, fauce ampliata 5-loba, lobis brevibus, plicis faucialibus obsoletis, annulo ad basim tubi nudo. — *L. canescens* var. Torr. Bot. Whipp. p. (68) 124. — Grass Valley, California, Dr. Bigelow. The anthers are high and the style short; but this is probably only one form.

L. CANESCENS Lehm. Pube molli primum canescens: corolla læte aurea, plicis faucialibus pubescentibus prominulis, annulo basilari nudo. — *L. sericeum* Lehm. must belong to this, but the synonym *Anchusa Virginica* Linn. is to be excluded. I do not know what the glabrous plant in the Linnæan herbarium is; but the Gronovian plant is an *Onosmodium*, Morison's is probably *Lithospermum hirtum*, which is the Puccoon of the Southern States, and Plukenet's may be either species.

L. HIRTUM Lehm. Pube hispida demum asperum; floribus majoribus; corolla læte aurantiaca, plicis faucialibus prominulis, annulo basilari dentibus 10 hirsutissimis instructo. — *L. Bejariense* DC. is of this species.

+ + Folia omnia linearia angusta: corollæ bene evolutæ tubo prælongo, plicis faucialibus fere fornicatis, lobis inciso- vel undulato-crenulatis.

L. ANGUSTIFOLIUM Michx. *L. linearifolium* Goldie? *Pentalophus longiflorus* & *P. Mandanensis* A. DC., cum syn. cit. etc. *L. breviflorum* Engelm. & Gray, Pl. Lindh. 1, p. 44. — It is to Mr. Bebb (see Amer. Naturalist, 7, p. 691) that we owe the demonstration that the long-flowered species (*L. incisum* Lehm. &c.) is the perfect form, as we may say, which, later in the season and especially upon lateral shoots, goes on to produce depauperate flowers, with corolla and style hardly equalling the calyx, and without doubt of cleistogenous fertilization. In this state it is *L. angustifolium* Michx. — the earliest and an appropriate name.

lished in Silliman's Journal in the year 1862. They mainly relate to the various plants which I had referred to *M. alpina*, of which I had formed a heterogeneous assemblage. Mr. Watson discerned this, and, in the Botany of King's Exploration, distinguished *M. brevistyla*, but without noticing that he had under that name the original *M. alpina*, founded on James's plant of Long's Expedition. *M. alpina* differs, I find, from all the rest, in having extremely short and not broad filaments, and also an included style. In James's plant, as in Mr. Watson's, the stamens are inserted on the middle of the tube of the corolla, and the style hardly surpasses the base of the included anthers. There is another form, as I must regard it, differing only in the insertion of the anthers on the throat, and a correspondingly *longer* style, which brings the stigma up to the level of the orifice of the tube, — a dimorphism the reason and operation of which I do not understand; but something similar occurs in other *Borraginaceæ*, such as *Amsinckia*. The specimens with enlarged filaments, as long as the anthers or longer, and with long capillary exserted style, which I had confounded with *M. alpina*, prove to be the *Pulmonaria lanceolata* of Pursh and *P. marginata* Nutt.; and to it I refer *M. Fendleri*, in which all degrees between a deeply 5-parted and a barely 5-cleft calyx occur, varying even in the same individual. As to *M. Drummondii*, which I had referred to *M. alpina*, and Hooker to *M. Virginica*, I now regard it as an arctic form of *M. Sibirica*. The little folds in the throat of the corolla, which I formerly failed to see, are evident in original specimens in Dr. Torrey's herbarium. The species may be rearranged as subjoined.*

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* MERTENSIÆ Boreali-Americanæ.

§ 1. STENHAMMARIA. (*Steenhammera* Reichenb.) Nuculæ magis carnosæ demum utriculatæ, lævissimæ, acutæ: corolla brevis.

1. M. MARITIMA Don. Amphigæa.

§ 2. EUMERTENSIA. Nuculæ opacæ, plus minus rugosæ vel scabridæ, obtusæ.

* Corolla tubæformis, prælonga, limbo subintegro, plicis faucialibus obsoletis: filamenta gracilia elongata: discus hypogynus in lobos 2 iis ovarii adæquantes productus. — *Mertensia* Roth.

2. M. VIRGINICA DC. *M. pulmonarioides* Roth. America boreali-orientalis.

* * Corolla limbo subcampanulato 5-lobo, plicis faucialibus manifestis.

← Filamenta anthera æquilata et breviora vel parum longiora, fauci semper inserta: stylus capillaris e fauce nunc ultra limbum exsertus.

AMSINCKIA Lehm. Dr. Torrey, in Bot. Mex. Boundary and in Bot. Whipple's Expedition, has justly remarked that the insertion of the stamens and the length of the style differs reciprocally in different individuals of the species. But, as in *Lithospermum*, the tendency is not completely carried out. It is here most marked in *A. spectabilis*. But in one specimen of it, and also in one of *A. lycopsoides*, along with very low stamens the style was still shorter. In these, and in the low-stamened and long-styled form of *A. spectabilis*, only have I found minute hairy tufts in the throat, in the place of the crests of the allied genera; and their place is marked externally by a slight intrusion, showing that they answer to plicæ. No trace of them is discerned when the stamens are borne in the throat or high up in the tube. The "plicis intrusis" by which the glabrous throat of the corolla of *A. spectabilis* is "semiclausa," according to Fischer and Meyer's original character, are the longitudinally plicate sinuses, which are considerably infolded, at least in the bud. While reducing three of the species

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++ Corolla tubo calyce limboque suo 2–3-plo longiore.

3. M. OBLONGIFOLIA Don. *Pulmonaria oblongifolia* Nutt.

++ ++ Corolla tubo limbo suo parum vel sesquilongiore.

4. M. SIBIRICA Don; Gray in Sill. Jour. 34, p. 341.

Var. DRUMMONDII: forma alpina, spithamæa; foliis oblongis sessilibus vix ultrapollicaribus fere aveniis margine obsolete denticulato-ciliolatis; corollæ (lin. 5 longæ) tubo quam limbus vix parumve longiore calycis lobis ovato-oblongis subduplo longiore. — *Lithospermum Drummondii* Lehm. *Mertensia Drummondii* Don. Arctic sea-coast, Richardson, ex Hook. (Vide supra.)

5. M. PANICULATA Don; Gray, l. c.

6. M. LANCEOLATA DC. cum syn. cit. *M. alpina* pro parte, Gray, l. c. That this plant is Pursh's *P. lanceolata* and Nuttall's *P. marginata*, I learn from the original specimens of both, which have somehow found their way (I believe through Prof. Tuckerman's purchase) from Lambert's herbarium to that of the Academy of Natural Sciences, Philadelphia.

Var. FENDLERI, forma calyce tantum 5-fido. — *M. Fendleri* Gray, l. c.

+ + Filamenta brevissima, haud dilatata, aut fauci aut tubo inserta: stylus inclusus.

7. M. ALPINA Don, Gray, l. c. pro parte. (*Pulmonaria alpina* Torr.) *M. brevistyla* Watson, Bot. King, p. 339, t. 23, fig. 112, forma antheris tubo medio insertis inclusis, stylo brevi. — As I noticed in the Revision of the genus, this species is dimorphous in an unusual way, the flowers with the higher stamens inserted at the throat having the *longer* style, which brings the stigma up to the throat; and those with low and included stamens have a still shorter style, with the stigma only a little higher than the base of the anthers!

of the Prodromus, I am compelled to add two others. The known species may be discriminated as follows: * —

ANTIPHYTUM DC. I do not know the Brazilian species, but the genus originates with *A. Mexicanum* DC., founded on one of Moçino and Sesse's drawings, probably a congener of *A. heliotropioides* A. DC. *A. linifolium* and *A. Walpersii* are *Eritrichia.* A character of *A. heliotropioides*, and of another species which I venture to associate with it, is probably alluded to in De Candolle's generic character, *i.e.* a small perforation in the large scar of the nutlets; and

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* AMSINCKIA, Lehm., Fisch. & Meyer.

§ 1. Nuculæ (*Eritrichium* § *Plagiobothrys* referentes) opacæ, asperatæ vel rugosæ, ovato-trigonæ, subincurvæ, intus ab apicem usque ad cicatricem sat latam carinatæ,

* Dorso convexo carinatæ.

+ Corolla tubo calyce 2–3-plo longiore: plantæ sæpius strictæ, angustifoliæ.

1. A. SPECTABILIS Fisch. & Meyer. Corolla aurantiaca, sæpius semipollicaris, fauce ampliata: antheræ lineari-oblongæ, aut fauciales exsertæ aut infra medium tubi: calyx rufo-hirsutus: nuculæ granulato-rugulosæ vel submuricatæ.

2. A. ECHINATA. Corolla ut videtur flava, tenuis, lin. 3–4 longa, fauce vix ampliata: antheræ brevi-oblongæ fauce inclusa: calyx fulvo-hispidus: nuculæ dorso magis convexæ undique molliter echinatæ. — Sandy plains in the Mohave district, south-eastern part of California, Dr. J. G. Cooper, Feb. 1861. Nutlets only a line long, beset with slender and narrow but rather soft prickly processes, and between them sharp granulate points.

++ Corolla tubo calycem flavido-hispidum vix superante.

3. A. LYCOPSOIDES Lehm. Ramosa: antheræ aut sub fauce aut supra medium tubi insertæ, oblongæ: nuculæ dorso valde convexæ, muriculato-rugosæ.— *A lycopsoides* (Lehm.) & *A. intermedia* Fisch. & Meyer. *A. Douglasiana* A. DC.

* * Nuculæ dorso lato planiusculo minime carinato.

4. A. TESSELLATA. Validior, setoso-hispida: folia lineari-lanceolata vel oblonga: corolla aurantiaca, hypocraterimorpha, tubo (lin. 3 longo) calyce rufidulo-hispido paullo longiore: nuculæ lato-ovatæ, verrucis truncatis crebris (aut inordinatis aut in lineas transversas coordinatis) instructæ demum quasi tesselatæ. — California and Nevada. Contra-Costa Mountains near Monte Diablo, Brewer. Fort Tejon, Xantus. Near Carson City, Anderson. Sierra County, Lemmon. Humboldt Mountains, &c., Watson (*A. lycopsoides*, pro parte, Bot. King), and Pahranagat Mountains, Miss Searls. Nutlets pretty large.

§ 2. Nuculæ triquetræ, rectæ, lævissimæ, sæpius eburneæ, dorso fere plano, angulo ventrali acuto infra medium cicatrice angusta.

5. A. VERNICOSA Hook. & Arn. — Little known; thus far collected only by Douglas and by Coulter.

this decides me to exclude them from *Eritrichium*, with which Dr. Torrey combined them. This small perforation is occupied by a filiform funiculus-like process, which remains attached to the receptacle when the nutlet is detached. The gynobase is flat, merely umbonate at the origin of the short style.

ANTIPHYTUM HELIOTROPIOIDES A. DC. Prodr. 10, p. 122. In Mexico, on the borders of (but not known within) the United States, Berlandier, coll. no. 2217, 3108. Also Coulter's Mexican collection, no. 1055. No. 75 coll. Xantus, Lower California, referred to this species by me, has neither flowers nor fruit, and is very uncertain. All the plants referred to this species by Torrey, in Bot. Mex. Bound. p. 140, Berlandier's excepted, are very different, namely, *Eritrichium hispidum* of Buckley. Alphonse De Candolle's character is a good one, except that many of the leaves are alternate. The slender pedicels are characteristic. The turgid nutlets have a very large scar, occupying the breadth and almost the lower half of the length of the inner face, flat, bordered by a sharp and thin entire margin, the perforation in its upper part. Stigma somewhat capitate, entire. Crests in throat of corolla conspicuous.

ANTIPHYTUM FLORIBUNDUM. Herbaceum e radice "perenni" vel bienni, erectum, 1–3-pedale, cinereo-hispidum; foliis fere omnibus alternis linearibus; racemis brevibus paniculatis; pedicellis calyce 2–3-plo brevioribus, inferioribus bracteatis; corolla rotato-campanulata calycis 5-partiti segmenta lineari-lanceolata vix superante, fauce prorsus nuda, lobis brevibus rotundatis; filamentis anthera longioribus; stigmate bilobo; nuculis creberrime verrucoso-scabris ventre carinatis, cicatrice parvula circulari immarginata centro perforata. — *Eritrichium floribundum* Torr. Bot. Mex. Bound. p. 140. — Borders of Texas, mountains of Puerte de Paysano and Rock Creek, near the Rio Grande, Bigelow. This accords well in structure with the preceding, except in the total absence of the crests at the throat of the corolla.

ERITRICHIUM Schrader. The central and western regions of North America abound in species of this genus, and a revision of them was greatly needed. The result of a recent study of them is here appended.* With the exception of the Myosotideous *Eueritrichia*, the

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* ERITRICHIUM Schrad. et Auct.

Eritrichium, *Plagiobothrys* & *Krynitzkia* (Fisch. & Meyer), DC. Prodr. — *Piptocalyx* Torr.

§ 1. EUERITRICHIUM. (*Eritrichium* Schrad., Koch.) Nuculæ gynobasi convexæ basi intus oblique affixa, cicatrice brevi sæpius rotunda vel oblonga: semen

species on the whole, as now characterized, are fairly well marked. The principal difficulties encountered were the inevitable consequence

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amphitropum adscendens: pedicelli haud articulati: calyx 5-partitus, persistens: corollæ tubus brevis: flores nunc bracteati nunc ebracteati.

* *Echinospermoidea*, nuculis ala pectinata cinctis, arctico-alpina, perennia, floribus læte cæruleis.

E. NANUM Schrad., var. ARETIOIDES Herder. *E. aretioides* DC. *E. villosum* var. *aretioides* Gray in Proc. Acad. Philad. 1863, p. 73; Wats. Bot. King, p. 241. *Myosotis nana* Torr. Ann. Lyc. N. Y. Arctic and Alaskan Islands; highest Rocky Mountains from Wyoming to Colorado and Eastern Utah; the latter smaller in all its parts. In both forms, the pectinate lobes of the wing-like border of the nutlets bear a few rigid bristly points, which only need to turn backwards to be glochidiate.

* * *Myosotidea*, annua (pauca in Amer. Austr. perennia); foliis linearibus, inferioribus sæpius oppositis; corolla alba; nuculis haud marginatis pl. m. rugosis. (Species inter se ambiguæ.)

E. PLEBEIUM A. DC. Procumbens, sparsiflorum; calyce pedicello duplo longiore corollæ limbum parvulum æquante; nuculis glabris grosse rugoso-reticulatis lineam longis ovato-trigonis dorso versus apicem angustatum carinatis. — *Lithospermum plebeium* Cham. & Schlecht. Unalaska and other Alaskan Islands, Chamisso, Harrington. Crests in throat of the small corolla inconspicuous and smooth.

E. CHORISIANUM DC. Diffusum, mox procumbens; foliis inferioribus oppositis; floribus laxe racemosis hinc inde folioso-bracteatis; pedicellis saltem inferioribus calyce 2–4-plo longioribus patentibus fulvo-hirsutis; corollæ lobis tubo suo longioribus calycem multum superantibus, cristis faucialibus conspicuis luteis pubescentibus; nuculis minoribus minus rugosis papilloso-scabris dorso a basi ad apicem subcarinatis; cicatrice anguste oblonga. — *Myosotis Chorisiana* Cham. & Schlecht. *Eritrichium connatifolium* Kellogg in Proc. Calif. Acad. 2, p. 103, fig. 51. *Bothriospermi* sp. Benth. Pl. Hartw. no. 1874. — California, along the coast.

E. SCOULERI A. DC. Erectum, gracile, spithamæum ad pedale; spicis nudis sæpe geminatis demum strictis confertifloris; pedicellis brevissimis erectis; calyce fructifero subclauso; corolla præcedentis vel minore; nuculis minoribus (semilineam longis) rugosis glabratis late ovatis, cicatrice rotunda. — *Myosotis Chorisiana* Lehm. in Hook. Fl. Bor.-Am., non Cham. *M. Scouleri* Hook. & Arn. Bot. Beech. p. 370. *Eritrichium plebeium* Torr. Bot. Whipp. p. 68, non DC. *E. Chorisianum* (no. 408), *plebeium* (406) & *Californicum*, pro parte, Gray, Pl. Hall, in Proc. Am. Acad. 8, p. 397. — Oregon and California, along and near the coast.

E. CALIFORNICUM DC. Biunciale ad subpedale, diffusum; floribus subsessilibus demum sparsis plerisque folio subtensis; corolla minima calyce (fructifero subpatulo) vix longiore, cristis faucialibus inconspicuis fere glabris, lobis tubo suo brevioribus; nuculis ovato-oblongis transversim rugosis scabridis;

of their having been described from time to time in a piece-meal way, and by several different hands.

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foliis fere omnibus alternis parvulis. — *Myosotis Californica* Fisch. & Meyer. — California and Oregon to New Mexico and Saskatchawan.

[E. KINGII Watson (vide p. 60) may be found to belong to this section, when mature fruit is known.]

§ 2. PLAGIOBOTHRYS. (*Plagiobothrys* Fisch. & Meyer, A. DC.) Nuculæ gynobasi hemisphericæ medio affixæ, ovato-trigonæ, subito acutæ, pl. m. incurvæ, transversim rugosæ, ventre medio concavo ad insertionem strophiolato, strophiola persistente: ovulum amphitropum. Herbæ annuæ, parvulæ, villoso-hirsutæ, floribus *Eueritrichii*.

Four North American species can be made out, one of which is also Chilian, and there is a fifth, *E. tinctorium* A. DC., in Chili; the latter with commonly bracteate and scattered flowers, and nutlets only half as large as in *E. fulvum*. The granulation or murication of the surface of the nutlets is too variable and inconstant for specific characters.

* Nuculæ plus minus opacæ, lineis angustis irregularibus elevatis rugosæ.

E. FULVUM A. DC. Spithamæum ad pedale; pube fulva in calycibus rufa; spicis demum laxis; nuculis opacis lineis elevatis grosse rugosis, carina dorsali vix conspicua. — *Myosotis fulva* Hook. & Arn. Bot. Beech. p. 38 & 369. *Plagiobothrys rufescens* Fisch. & Meyer, Ind. Sem. Petrop. 1835, p. 46; A. DC. Prodr. 10, p. 134. *Bothriospermi* sp. Benth. Pl. Hartw. no. 1873. — Chili, California and Oregon.

E. CANESCENS. Pube etiam calycis albida; spicis demum elongatis; nuculis subopacis lineis elevatis longioribus dorso transversim rugosis. — *Myosotis cymosa* Nutt., an unpublished name mentioned in Hook. Kew Jour. Bot. 3, p. 294. *Plagiobothrys canescens* Benth. Pl. Hartw. no. 1871, p. 326. — California, Douglas, Coulter, Fremont, Hartweg; Oregon, Tolmie, Nuttall, E. Hall. Apparently found only towards the coast. The nutlets incline to dehisce down the ventral ridge to the insertion. This species is in Coulter's Collection, no. 511. It is also in that of Douglas, a stout and very leafy form. It is therefore likely to be either the plant referred in Bot. Beechey, p. 369, to *Myosotis flaccida*, or else the *M. muricata* Hook. & Arn.

* * Nuculæ (lato-ovatæ) vitreo-nitidæ, lineis angustissimis fere rectis inter rugas transversales applanatas exsculptæ: corollæ parvæ.

E. TENELLUM. Molliter hirsutum, pube superne præsertim calycis fulva; caulibus e rosula foliorum radicalium erectis sæpius exiguis; foliis lato-linearibus seu oblongo-lanceolatis; spicis brevibus vel interruptis basi tantum foliatis; nuculis maturis nitentibus albis basi et apice subito contractis quasi cruciatis, facie concava, rugis dorsalibus muricatis. — *Myosotis* (*Dasymorpha*) *tenella* Nutt. in Hook. Kew. Jour. Bot. l. c. p. 295. *Eritrichium fulvum* Wats. Bot. King, p. 243, & Gray, Proc. Am. Acad. 8, p. 397, non A. DC. — British Columbia to the northern and eastern parts of California, and through Idaho and Nevada. The mature nutlets have the aspect of vitreous enamel; the close transverse

CYNOGLOSSUM OCCIDENTALE. *C. Virginico* potius quam *C. grandi* affine, scabrido-hirsutum; caule vix ultrapedali ad apicem fere foliato;

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rugæ run nearly unbroken and straight across the broad back from the low dorsal ridge to the margin.

E. TORREYI. Hispido-hirsutum, pube etiam calycis albida; caulibus diffusis, ramis floridis usque ad apicem sæpius foliosis; foliis oblongis, superioribus inter flores; nuculis albidis nitidulis apice tantum contractis, rugis latis lævissimis. — Sierra Nevada, California; in or near the Yosemite Valley, Torrey, a form with rather erect flowering stems and spicate inflorescence, the bracts hardly exceeding the flowers: Sierra Valley, Lemmon (1874), much branched from the root, diffusely spreading, the flowering branches equally leafy to the top, the upper leaves among and beyond the scattered flowers. Nutlets rather larger than in *E. tenellum*, somewhat over a line long, destitute of the cruciform outline (like that of the club of cards), and of the sharp murication, but at the margin sometimes obsoletely tuberculate.

§ 3. PIPTOCALYX. (*Piptocalyx* Torr.) Nuculæ, gynobasis, et cetera *Krynitzkiæ:* calyx 5-fidus circumscissus, basi membranacea quasi 5-crenulata persistente: corolla fauce prorsus nuda: flores folioso-bracteati sessiles.

E. CIRCUMSCISSUM. Annuum, pusillum, diffusum, albido-hispidum; foliis angusto-linearibus, ramealibus floribusque alaribus et subaxillaribus confertis; staminibus medio tubi corollæ albæ insertis; nuculis oblongo-ovatis lævissimis nitidis gynobasi subulato-pyramidatæ angulo ventrali a basi fere ad apicem adnatis; semine amphitropo-pendulo. — *Lithospermum? circumscissum* Hook. & Arn. Bot. Beech. p. 370. *Piptocalyx circumscissus* Torr. Bot. Wilkes, Phan. Pacif. p. 414, t. 12 B; Wats. Bot. King, p. 240. Southeastern California through the interior desert region to Washington and Wyoming Territories.

§ 4. KRYNITZKIA. (*Krynitzkia* Fisch. & Meyer, cum spp. *Eritrichii* DC., etc.) Nuculæ gynobasi elatæ sæpius angustæ ("styli basi" auctorum) angulo ventrali a basi ad medium vel ad apicem usque affixæ, cicatrice aut angustissima aut inferne latiore pl. m. exarata: semen aut amphitropum aut rarius fere anatropum (*E. leucophæo* excepto): corolla alba fere semper parva: calyx 5-partitus persistens, in spp. genuinis cum fructu incluso articulo quandoque secedens.

* *Eukrynitzkia:* annua, calyce hispidissimo, stylo brevi: nuculæ immarginatæ lateribus obtusis vel rotundatis,

+ Angulo ventrali cicatrice vel sulco angustissimo percurso gynobasi fere subulatæ affixæ.

++ Pusillum, hirsuto-canescens; floribus minimis congestis folioso-bracteatis; corollæ fauce nuda; nuculis lævibus; calyce fructifero diu persistente.

E. MICRANTHUM Torr. Mex. Bound. p. 141. Utah to W. Texas.

++ ++ Parvula; floribus in spicis demum elongandis; calyce setoso-hispido sæpius cum fructu secedente.

E. OXYCARYUM. Hirsuto-canescens, gracile, spithamæum ad pedale; foliis angustissime linearibus; spicis demum strictis confertifloris; corollæ parvæ

foliis viridibus oblongis lanceolatisve plerisque obtusis cum apiculo, inferioribus spathulatis inferne sensim in petiolum alatum attenuatis,

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fauce nuda; setis calycis apice subuncinatis; nucula fertili sæpissime unica ovato-lanceolata acuminata lævissima sesquilineam longa gynobasi 2–3-plo longiore, sulco tenui. — Common in Oregon and California; often confounded with or mistaken for the next, as in the collections of Douglas and Hartweg.

E. LEIOCARPUM, Watson, Bot. King, p. 244. Hispidum; corollæ cristis faucialibus manifestis; nuculis 4 ovatis seu oblongo-ovatis acutis lævissimis nitentibus gynobasi subulatæ altius adnatis et paullo longioribus. — *Krynitzkia leiocarpa* Fisch. & Meyer. *Myosotis flaccida* Dougl. in Hook. California to British Columbia and Saskatchawan.

E. MURICULATUM (A. DC.?) Torr. Bot. Wilkes, l. c. p. 416, t. 13 A. *Myosotis muricata* Hook. & Arn.? A præcedente persimili differt nuculis sæpe majoribus latioribus granulato- vel muriculato-scabris, cicatrice parum latiore.— Same range as the last, but not known so far northward or eastward. To this belong many specimens referred by Dr. Torrey to the next species, and also so referred by Watson in Bot. King. Expl. Perhaps the *Myosotis muricata* of Ruiz & Pav., and *Eritrichium alyssoides* DC., of Chili, are the same thing. Very likely this species is not Hooker and Nuttall's *Myosotis muricata*, as I have not seen it in Douglas's Californian collection. The plants which I possess of that collection, upon one or the other of which *M. muricata* would seem likely to have been founded, are, one of them my *E. oxycaryum*, which is more probably what was referred to *M. flaccida*; the other one, *E. canescens* without fruit, which therefore may represent *M. muricata* Hook. & Arn.

E. ANGUSTIFOLIUM Torr. Spithamæum, diffusum, setis rigidis hispidissimum sæpius cum pilis mollioribus; foliis angusto-linearibus; floribus in spicas elongandas etiam fructiferas confertas arcte sessilibus; calycis fructiferi persistentis segmentis lineari-filiformibus erectis; corollæ parvæ cristis faucialibus prominulis; nuculis (haud ultra semilineam longis) oblongo-ovatis crebre minuteque granulatis ventre sulco ab apice ad basim sensim latiore gynobasi conico-subulatæ affixis. — Pacif. R. R. Exped. 5, p. 363, Bot. Mex. Bound. p. 141. W. Arizona and adjacent part of California. It is no. 500 of Coulter's collection; and no. 76 of that of Xantus in Lower California was correctly referred to it. But specimens of other species, notably of the preceding, have been confounded with it.

+ + Nuculæ (*E. Texano* excepto) cicatrice latiore breviore excavata gynobasi angusto-pyramidatæ vel subulato-conicæ affixæ: corolla parva.

++ Calycis segmenta lanceolata haud incrassata: nuculæ 4 consimiles, triangulari-ovatæ, dorso muricato-granulatæ, vix ultra semilineam longæ.

E. PUSILLUM Torr. & Gray in Pac. R. R. Expl. 2, p. (171) 15. Pygmæum; corollæ cristis faucialibus evanidis; nuculis angulis lateralibus acutis, faciebus internis concavis lævibus, angulo ventrali cicatrice lanceolata infra apicem evanida. — New Mexico and borders of Texas.

E. HISPIDUM Buckley in Proc. Acad. Philad. 1861, p. 462. Spithamæum, cinereo-hispidum, ramosissimum; foliis linearibus; spicis paniculatis laxis sæpe

superioribus basi lata sessilibus semi-amplexicaulibus; pedunculo breviusculo; cyma nuda parvula; corollæ tubo (lin. 2–3 longo) calycis lobis

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foliatis; corollæ cristis faucialibus prominulis; nuculis haud angulatis usque ad cicatricem sat magnam deltoideam excavatam muricato-granulatis. — *E. heliotropioides* Torr. Mex. Bound. p. 140, excl. syn. DC. & pl. Berland. *E. griseum* Torr. in herb. *Amsinckiæ* sp.? Benth. Pl. Hartw. no. 157. Southwestern Texas to New Mexico and Mexico. Very different from *Antiphytum heliotropioides* A. DC., with which Dr. Torrey confounded it. (No. 1572 of Wright's collection is cited by mistake or misprint as 1512.) Fruiting calyx densely hispid, little more than a line long, closed, detached by an articulation at full maturity. Scar of the nutlets occupying the lower half of the inner face. Buckley's specimens (the character being of no account) show that this (and not *E. Texanum*) is his *E. hispidum*.

++ ++ Calycis segmenta linearia, obtusa, setis validis hispida, lin. 2–3 longa, fructifera clausa, costa valida incrassata indurata: nuculæ heteromorphæ, majores: folia subspathulata.

E. Texanum A. DC. Subpedale; floribus in spicis laxis fere aphyllis subsessilibus; nuculis 3 abortivis, unica fertili majuscula oblongo-ovata lævi (minutissime crebreque puncticulata) cicatrice angustissima infra medium gynobasi parvulæ conico-columnari affixa. — Texas, near Austin, &c., Drummond, Wright, E. Hall. Fruiting calyx smaller and with midribs less thickened than in the next, readily separating by an articulation.

E. crassisepalum Torr. & Gray, in Pac. R. R. Expl. l. c. Spithamæum; floribus plerisque folioso-bracteatis breviter pedicellatis; calyce fructifero valde incrassato; nuculis 4 fertilibus, 3 muricato-granulatis, quarta majore fere lævi, cicatrice excavata ovato-lanceolata. — W. Texas and New Mexico to Nebraska and Saskatchawan. The thickened pedicel with fruiting calyx persistent, or very tardily separating by an articulation.

+ + + Nuculæ (immaturæ) a basi fere ad medium gynobasi lato-pyramidatæ affixæ; corolla majuscula, limbo lin. 3–4 lato.

E. Kingii Watson, Bot. King. p. 243, t. 23. Eastern side of the Sierra Nevada. Mature fruit appears not to have been collected. It may refer this peculiar species to the first section or to the following subdivision.

* * *Pseudo-Myosotis* A. DC.: perennia vel biennia, floribus pro genere amplis thyrsoideo-congestis, cristis faucialibus corollæ prominentibus fornicatis, stylo sæpius elongato, antheris lineari-oblongis: nuculæ triquetræ, angulis acutis: gynobasis pyramidato-subulata.

+ Syncarpium depresso-globosum, e nuculis lævissimis crassis circumscriptione fere semicirculari: corolla tubo brevi lato intus basim versus annulo 10-squamulato instructo: spicæ paniculatæ demum elongandæ.

E. Jamesii Torr. in Marcy, Rep. p. 294. *E. multicaule* Torr. l. c., forma hispida. *Myosotis suffruticosa* Torr. in Ann. Lyc. N. Y. 2, p. 225. W. Texas and New Mexico to Wyoming.

primum lineari-oblongis longiore lobis suis 2–3-plo longiore; nuculis mox horizontalibus tumido-convexis. — Sierra Nevada, in the north-eastern part of California, Rev. Mr. Burgess, and Sierra County, J. G. Lemmon.

PECTOCARYA DC. The radicle is certainly not centrifugal, as stated by Alph. De Candolle, in Prodr. 10, p. 1 and p. 120, foot-notes, but centripetal, as declared by Torrey, in Pac. R. R. Expl. 4, p. 124. Also *Cynoglossum pilosum?* Nutt. Gen. 1, p. 114, cannot be *Pectocarya penicillata*, which is unknown east of California. It is doubt-

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+ + Syncarpium ovoideo-pyramidatum: corollæ annulus obscurus: thyrsus densior e spicis brevibus.

E. GLOMERATUM DC. Bienne, hispidum, corollæ tubo calycem hispidissimum haud superante lobis parum longiore: nuculis dorso tuberculato-rugosis.— Var. HUMILE; inferne canescens pube molliore. Saskatchawan and along the higher Rocky Mountains and Sierras. Nuttall collected and gave MSS. names to some very dwarf and silky-canescent forms, which appear to belong here. — Var. HISPIDISSIMUM Torr.: subpedale; spicis magis evolutis vel paniculatis; floribus minoribus. Plains of Upper Missouri to New Mexico. A more distinct variety is

Var. VIRGATUM Porter, Syn. Fl. Colorad. p. 102. (*E. virgatum* Porter in Hayd. Report, 1870, p. 479.) Undique hispidum; caule stricto 1–3-pedali; glomerulis sæpius sessilibus brevissimis foliis fulcrantibus angusto-linearibus plerumque multo brevioribus in spicam longissimam virgatam foliosam congestis. — Colorado Territory, along the eastern base of the Rocky Mountains, and up to 8000 feet; Parry, E. Hall, Porter, &c.

E. FULVOCANESCENS. Perenne, humile, cæspitosum, inferne strigoso- vel subtomentoso-sericeum; corollæ tubo calyce aureo- seu fulvo-hirsutissimo longiore lobis suis 2–3-plo longiore; nuculis granulato-scabris. — *E. glomeratum* var.? *fulvocanescens* Watson, Bot. King, p. 243. — Rocky Mountains to the Sierra Nevada, at 5–11,000 feet, and south to New Mexico. Intermediate and ambiguous between the var. *humile* of the preceding and the following.

E. LEUCOPHÆUM A. DC. Perenne e basi ut videtur lignescente, argenteo-sericeum, superne fulvo-hirsutum; corollæ tubo calycem superante lobis 2–3-plo longioribus; antheris infra-faucialibus; stylo longissimo; nuculis (lin. 1½–2 longis) ovato-triquetris lævissimis eburneis. — *Myosotis leucophæa* Dougl.; Hook. l. c. t. 163. Interior dry region, from the borders of British Columbia to Oregon, E. California, and S. Utah. The flowers, said in Hooker's Flora to be white, are certainly sometimes yellow.

* * * *Pterygium.* Fere *Eukrynitzkiæ*, sed nuculis aut tribus aut omnibus ala crenata vel pectinatilobata circumdatis: annua, calyce fructifero modo generis erecto, lobis ovatis.

E. PTEROCARYUM Torr. Bot. Wilkes, p. 415, t. 13 B; Wats. Bot. King, p. 245. — Var. *pectinatum*, forma alis fructus pectinato-multifidis. — Dry interior region, Washington Territory to Arizona and the borders of Texas. The var. S. Utah, Parry.

less *Echinospermum Redowskii.* All the species of *Pectocarya* in the Prodromus appear to be forms of *P. lateriflora*, except *P. penicillata*, and even that may pass into forms of the other species.

III. *Synopsis of North American Species of Physalis.*

The North American flora hardly contains a more difficult genus for its size than *Physalis.* A painstaking study of all the materials at my command leads to the results which are expressed in the following synopsis.

PHYSALIS Linn.

§ 1. CHAMÆPHYSALIS. *Chamæsarachæ** sat similis: folia nonnulla

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* SARACHA Ruiz & Pav. § CHAMÆSARACHA. Calyx fructifer fere herbaceus, vix venosus, baccæ apice tantum nudæ arcte conformis: semina rugoso-favosa vel puncticulata. Herbæ parvulæ humiles e radice perenni; foliis angustioribus basi in petiolum marginatum cuneato-attenuatis aut subintegerrimis aut inciso-pinnatifidis; pedicellis solitariis rarius geminis filiformibus post anthesin refractis.

* A basi ramosæ, diffusæ vel decumbentes: semina favosa.

S. SORDIDA. *Withania? sordida* Dun. in DC. Prodr. 13, p. 456. *Solanum coniodes* Moricand ex Dun. l. c. p. 64. — The two species of the Prodromus are founded upon the same (less villous, but more pubescent) form of a common Texano-Mexican species.

S. CORONOPUS. *Solanum Coronopus* Dun. l. c. p. 64. *Withania? Coronopus* Torr. Mex. Bound. p. 155. A related but more widely diffused species. It extends westward to Arizona (Dr. Palmer, &c.) and Southern Utah, Capt. Bishop.

S. ACUTIFOLIA Miers in Ann. & Mag. Nat. Hist. 1849, & Ill. S. Am. Pl. 2, p. 19, described from a fragment in herb. Hook. of no. 593 of Coulter's Californian collection, I have not seen, nor any Californian plant of the kind. Not improbably it was collected in what is now Arizona, and perhaps it is the *S. Coronopus;* but the description does not well accord; for the leaves are said to be very acuminate, the peduncle somewhat 2-flowered, this and the pedicel together only half an inch long, and anthers as long as the filament.

* Caules brevissimi conferti, subsimplices: semina læviuscula, plana.

S. NANA. Haud viscosa, pube brevi adpressa subcinerea, subcæspitoso-depressa; foliis in caulibus 1–3 uncialibus confertis ovato-lanceolatis seu oblongo-ovatis acutiusculis subintegerrimis basi rotundata vel cuneata in petiolum longum marginatum decurrentibus; pedicellis filiformibus petiolis brevioribus; corolla ut videtur alba cærulescente ultra semipollicem diametro. — California, in the Sierra Nevada, Nevada Co.? Kellogg (distrib. Kellogg and Harford, no. 719), Sierra Co., J. G. Lemmon. The fruit, recently communicated by the latter, is a rather dry globose berry, a quarter of an inch in diameter, girt and almost enclosed by the hemispherical thin calyx. The affinity to *Physalis grandiflora* is not remote.