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A New Mineralogical Nomenclature. By JAMES D.
DANA, A. M. (*Corresponding Member.*)

Read March, 1836.

THE chief obstacles to the introduction of a systematic method of naming the mineral species, have gradually been removed during the rapid progress which the science of mineralogy has of late years experienced. The difficulties have been still farther diminished by the important aid which Chemistry has rendered to mineralogical science, and also by the introduction of a natural classification of minerals, for which we are indebted to that deservedly distinguished German mineralogist, MOHS. In this arrangement, M. Mohs has not wholly relied upon chemical characters; the exclusive adoption of which would have degraded mineralogy from the rank of an independent science, and merged it in that of chemistry: nor has he depended on physical characters solely; for although the latter are more especially employed, the author has throughout been guided to a certain extent by that important source of physical characters, viz. chemical composition. A cabinet arranged according to the system of Mohs, presents with remarkable clearness, a chain of affinities running through the whole, and connecting all the several parts. The *Gases* and *Liquids*, with which the arrangement commences, are followed by the *Salts*, so disposed as to present an increase in stability, hardness, and lustre, as the eye proceeds onward. Among the *Gems*, we arrive at the diamond, in which these characters reach their climax. Thence descending in the series, we gradually pass through the *Metallic oxyds* to the *Native metals*. In these, the light-coloured species are followed by the *Sulphurets* and *Arsenids* of similar color and lustre, which are suc-

ceeded by the dark-colored metallic sulphurets; and these pass insensibly to the sulphurets without a true metallic lustre. From the latter there is a natural transition to *Sulphur*, and its close allies the *Resins* and *Coals*, with which the series terminates. By this association of species agreeing in external characters, the attention of the student is naturally led from the observation of their many resemblances, to a particular consideration of their several peculiarities. An arrangement of this kind is necessarily inadequate for the determination of the names of species: it may, however, be an important aid to those who have some general acquaintance with the science. The nomenclature proposed by Mohs, presents a very uncouth appearance when translated from the German into our less pliant language; and is moreover wholly destitute of that conciseness and elegance which the employment of the Latin language, confers upon the nomenclature of botany and zoology. To enable the science of mineralogy to participate in these advantages, which have exerted such an important influence upon the progress of those sciences, has been the design of the author in offering the following system of mineralogical nomenclature.

The arrangement of the species is in general similar to that proposed by Mohs, with such alterations as it was supposed would tend still further to exhibit their natural relations. In accordance with this view, the order *Mica* of Mohs has been abolished, and the species it comprised restored to their true congeners in other orders. The general characters of the orders are thus rendered liable to a few exceptions; but this inconvenience, which has thus far been found unavoidable in other departments of natural history, is deemed of little consequence, when contrasted with the violation of natural affinities which must otherwise ensue.

The following remarks will sufficiently explain the terms employed in the accompanying catalogue. The names of the species usually express either the primary form of the mineral,

the occurring form, the peculiarity of its cleavage, or some peculiar physical or chemical character. In specifying the crystalline form, the following terms have been employed, viz: *cubicus*, when the primary is a cube; *octahedrus*, when the regular octahedron; *dodecahedrus*, when the rhombic dodecahedron; *rhombohedrus*, when the rhombohedron; *pyramidalis*, when an octahedron not regular; *prismaticus*, when a prism, or more particularly a rhombic or rectangular prism. The several right prisms have been designated by a term indicating the base of the prism; thus *quadratus*, for right square prism; *rectangulus*, *rhombicus*, *rhomboideus*, respectively, for right rectangular, rhombic or rhomboidal prisms. The term *obliquus* has been restricted to the *oblique rhombic* prism, the oblique rhomboidal being expressed by the adjective *triclinatus*, in allusion to the three oblique inclinations of its axes.

Other more general terms have been occasionally employed, depending on the following classification of the primary forms, founded on the relations of their axes:

Class 1. *Monometrica*, (*μονος* one, and *μετρον* measure): includes the cube, regular octahedron and rhombic dodecahedron, in which the three axes are equal, or of one kind.

Class 2. *Dimetrica*, (*δισ* two, and *μετρον*): includes the right square prism and square octahedron, in each of which the axes are of two kinds.

Class 3. *Trimetrica*, (*τρεις* three, and *μετρον*): includes the right rectangular and rhombic prisms, and the right rectangular and rhombic octahedrons, in which the three rectangular axes are unequal.

Class 4. *Monoclinata*, (*μονος* one, and *κλινω* to incline): includes the right rhomboidal and oblique rhombic prisms in which one of the three axes is obliquely inclined to one of the remaining two.

Class 5. *Triclinata*, (*τρεις* three, and *κλινω*): includes the oblique rhomboidal prism, in which all three axes intersect at oblique angles.

Class 6. *Tetragonata*, (*τετραγα* four, and *ἄξων* axis): includes the hexagonal prism and rhombohedron, which have four axes.

The relations of the forms, in any one of these classes, is such that it may be impossible in some instances, from an entire indis-

tinctness of the cleavages, to determine which one is the primary; for either of the forms in the class Trimetrica (for example) may have the other three as secondaries.

The peculiarities of cleavage have been expressed as follows:

Acrotomus, ('ακρον summit, and τεμνω to cut off): cleavage parallel to the base of a prism or octahedron, or to a plane truncating the vertex of the rhombohedron.

Peritomus, (περι about, and τεμνω): cleavage parallel with each of the lateral planes.

Diatomus, (δια through, and τεμνω): cleavage in the direction of a diagonal plane.

Dystomus, (δυσ difficult, and τεμνω): cleavage difficultly obtained.

Eutomus, (ευ easily, and τεμνω): cleavage easily obtained.

The names proposed for the Classes are I. *EPIGÆA*, ('επι upon, and γαια earth); II. *ENTOGÆA*, (εντος within, and γαια); III. *HYPOGÆA*, (υπο beneath, and γαια): the *first* includes the fluids and those soluble minerals whose formation is going on at the present time from the decomposition of other species, and which therefore are necessarily *superterraneous*; the *second*, the species which occur in and compose rock-strata, and of which it is therefore appropriately said that their native situation is *within* the earth; the *third*, those which have been literally buried, as the coals and resins.

The remaining terms will be explained as they are employed.

Classis I. EPIGÆA.

G. under 3.8. No bituminous odor. Taste of solid individuals acid, alkaline, or saline.

Classis II. ENTOGÆA.

G. above 1.8. Tasteless.

Classis III. HYPOGÆA.

G. under 1.8.



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CLASSIS I. EPIGÆA.

Ordo 1. RHEUTINEA (ῥευτος, *fluid.*)

Gaseous or liquid.

Ordo 2. STERINEA, (στερεος, *solid.*)

Individuals solid.

CLASSIS II. ENTOGÆA.

Ordo 1. HALINEA, (αλινος, *saline.*)

H=1—5.5. G=1.8—3.3. Lustre unmetallic. Streak uncolored.

Ordo 2. BARYTINEA, (βαρυτης, *weight.*)

H=2—6. G=3—8.1. Lustre unmetallic.

Ordo 3. CERATINEA, (κεράς, *horn*;) in allusion to the lustre.

H=1—2. G=5.5—6.5.

Ordo 4. OSMERINEA, (ὀσμηρος, *odorous.*)

H=1—3. G=2—3.1. Lustre unmetallic. Streak uncolored. Odor, when moistened by the breath, argillaceous.

Ordo 5. CHALICINEA, (χάλιξ, *siler*; the species are mostly silicates.)

H=2—7. G=2.6—4. Lustre unmetallic. Streak uncolored.

Ordo 6. HYALINEA, (υαλινος, *glassy*; alludes to the high degrees of lustre.)

H=5.5—10. G=2.6—4.8. Lustre unmetallic. Streak uncolored.

Ordo 7. SCAPTINEA, (σκάπτος, *that which is dug*; includes the oxyds of the metals, the metallic silicates, and salts of metallic acids.)

H=1—7. G=2—8. Color dark red—black. Streak colored, unmetallic.

Ordo 8. METALLINEA, (μεταλλον, *metal*; includes the native metals.)

H=0—5. G=5.7—20. Lustre and Streak metallic.
Color white or reddish.

Ordo 9. PYRITINEA, (πυριτης, *pyrites*; includes the light-colored metallic sulphurets, arsenids and selenids.)

H=3—6.5. G=4.6—9.4. Lustre metallic. Color white—yellow—reddish.

Ordo 10. GALINEA, (γελειν, *to shine*; includes the dark-colored metallic sulphurets, arsenids, &c.)

H=1—4. G=4.2—8.5. Lustre metallic. Color dark.

Ordo 11. ADELINIA, (ἀδηλος, *unmanifest*; includes the non-metallic sulphurets, whose metallic nature is disguised by the mineralizing ingredient.)

H=1—4. G=3.3—5.9. Streak colored.

Ordo 12. THEUINEA, (θειον, *sulphur*.)

H=1.5—2.5. G=2—2.1. Streak yellowish-white.
Combustible.

Classis III. HYPOGÆA.

Ordo 1. PITTINEA, (πίττα, *pitch*.)

Easily fusible.

Ordo 2. ANTHRACINEA, (ανθραξ, *coal*.)

Infusible.

CLASS I.—EPIGÆA.

ORDER I. RHEUTINEA.

Genus 1. AER.

Gaseous.

- | | |
|----------------------|--------------------------------|
| Sp. 1. A. terrenus, | <i>Carburetted Hydrogen.</i> |
| 2. A. Hydrogenicus, | <i>Hydrogen.</i> |
| 3. A. Phosphoricus, | <i>Phosphuretted Hydrogen.</i> |
| 4. A. fetidus, | <i>Sulphuretted Hydrogen.</i> |
| 5. A. Azoticus, | <i>Nitrogen.</i> |
| 6. A. atmosphericus, | <i>Atmospheric Air.</i> |
| 7. A. Carbonicus, | <i>Carbonic Acid.</i> |
| 8. A. Sulphureus, | <i>Sulphurous Acid.</i> |
| 9. A. muriaticus, | <i>Muriatic Acid.</i> |

Genus 2. AQUA.

Liquid.

- | | |
|--------------------|------------------------|
| Sp. 1. A. limpida, | <i>Water.</i> |
| 2. A. Sulphurica, | <i>Sulphuric Acid.</i> |
-

ORDER II. STERINEA.

Genus 1. ACIDUM.

H=1—2. G=1.4—3.7. *Taste weak.*

- | | |
|----------------------|-----------------------|
| Sp. 1. A. Boracicum, | <i>Boracic Acid.</i> |
| 2. A. Arsenosum, | <i>Arsenous Acid.</i> |

Genus 2. BORAX.

H=2—2.5. G=1.7.—1.8. *Taste sweetish-alkaline.*

- | | |
|---------------------|---------------|
| Sp. 1. B. obliquus, | <i>Borax.</i> |
|---------------------|---------------|

Genus 3. ALUMEN.

H=2-3. G=1.5-1.9. *Taste styptic.*

- Sp. 1. A. officinale, *Native Alum.*
 2. A. volcanicum, *Solfatarite.*
 3. A. Magnesium, *Magnesian Alum.*
 4. A. Ammoniacum, *Ammonia Alum.*

Genus 4. NATRON.

H=1-3. G=1.4-2.2. *Taste alkaline.*

- Sp. 1. N. Gay-Lussianum, *Gay-Lussite.*
 2. N. efflorescens, *Natron.*
 3. N. permanens, *Trona.*

Genus 5. SAL.

H=2. G=2.2-2.3. *Taste purely saline.*

- Sp. 1. S. cubicum, *Common Salt.*

Genus 6. PICRALUM.*

H=1.5-2.5. G=1.4-2.8. *Taste saline and bitter.*

- Sp. 1. P. Glauberi, *Glauber's Salt.*
 2. P. Thenardianum, *Thenardite.*
 3. P. rhombicum, *Epsom Salt.*
 4. P. Reussii, *Reussite.*
 5. P. volcanicum, *Mascagnine.*
 6. P. Vesuvianum, *Aphthitalite.*
 7. P. octahedrum, *Sal-Ammoniac.*
 8. P. deliquesceus, *Nitrate of Magnesia.*
 9. P. tenellum, *Nitrate of Lime.*

Genus 7. NITRUM.

H=1.5-2. G=1.9-2.1. *Taste cooling and saline.*

- Sp. 1. N. rhombohedrum, *Nitrate of Soda.*
 2. N. rhombicum, *Nitrate of Potash.*

* Πικρὸς, *bitter*, and ἄλς *salt*. For the sake of euphony the aspirate has been dropped in the composition of this and similar words.

Genus 8. VITRIOLUM.

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H=2—2.5. G=1.8—3.2. Taste astringent and metallic, nauseous.

- | | |
|----------------------|------------------|
| Sp. 1. V. Martiale,* | Copperas. |
| 2. V. hexagonum, | White Copperas. |
| 3. V. parasiticum, | Yellow Copperas. |
| 4. V. Cyprium, | Blue Vitriol. |
| 5. V. Zincicum | White Vitriol. |
| 6. V. Cobalticum, | Cobalt-Vitriol. |
| 7. V. Uranicum, | Johannite. |
| 8. V. bicolor, | Botryogen. |

Genus 9. GÆALUM.†

H=2.5—3.5. G=2.7—2.9. Taste weak.

- | | |
|---------------------|-------------|
| Sp. 1. G. obliquum, | Glauberite. |
| 2. G. columnare, | Polyhalite. |

CLASS II.—ENTOGÆA.

ORDER I. HALINEA.

Genus 1. ASTASIALUS.‡

H=1.5—2. G=1—2.5. Decomposed in the flame of a candle.

- | | |
|-------------------------|------------------|
| Sp. 1. A. phytogeneus,§ | Oxalate of Lime. |
|-------------------------|------------------|

Genus 2. CRYALUS.||

H=2.25—2.5. G=2.9—3. Fusible in the flame of a candle.

- | | |
|--------------------|-----------|
| Sp. 1. C. fusilis, | Cryolite. |
|--------------------|-----------|

* The salts of iron were termed Martial by the alchemists, from Mars, the alchemistic name of iron.

† Γαῖα, earth, and ἅλς, salt, in allusion to the composition and slight solubility of the species.

‡ Ἀστάρως, unstable; alludes to the facility with which the species is decomposed.

§ Φυτογενεός, originating from plants; the species is supposed to be of vegetable origin.

|| Κρύος, ice, and ἅλς, salt; from the ready fusibility of the mineral.

Genus 3. ALUMINUS.

www.libtool.org H=5. G=2.7—2.8.

- Sp. 1. A. rhombohedrus, *Alum-Stone*

Genus 4. FLUELLUS.

H=4—5.5. G=2.9—3.4.

- Sp. 1. F. pyramidalis, *Fluellite*.
 2. F. octahedrus, *Fluor-Spar*.
 3. F. hexagonus, *Apatite*.
 4. F. obliquus, *Wagnerite*.
 5. F. rhombicus, *Herderite*.
 6. F. Childrenii, *Childrenite*.

Genus 5. ASTRALUS.*

H=3.5—4. G=2.3—2.4. *Mostly stellately and hemispherically columnar.*

- Sp. 1. S. rhombicus, *Wavellite*.

Genus 6. GYPSALUS.†

H=1.5—3.5. G=2.3—3. *One or more cleavages very perfect and easily obtained. Contain lime.*

- Sp. 1. G. stellatus, *Pharmacolite*.
 2. G. rhombicus, *Haidingerite*.
 3. G. rhomboideus, *Gypsum*.
 4. G. rectangulus, *Anhydrite*.
 5. G. Cobalticus, *Roselite*.
 6. G. fusilis, *Hydroboracite*.

Genus 7. CALCIUS.‡

H=2.5—4. G=2.5—3.3. *Contain lime.*

- Sp. 1. C. rhombohedrus, *Calcareous Spar*.
 2. C. rhombicus, *Arragonite*.
 3. C. Dolomæi, *Dolomite*.
 4. C. decolorans, *Ankerite*.

Genus 8. MAGNESIALUS.

H=1—4.5. G=2.5—3.2. *Contain magnesia.*

- Sp. 1. M. rhombohedrus, *Rhomb Spar*.
 2. M. fibrosus, *Magnesite*.
 3. M. pulvereus, *Hydromagnesite*.

* Αστρον, a star.

† Γυψος lime, and αλς salt.

‡ Καλς, lime.

ORDER II. BARYTINEA.

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Genus 1. BARALUS.*

H=2.5—4. G=3.3—4.8. Streak uncolored. Contain strontia or baryta.

- Sp. 1. B. rubefaciens,† *Strontianite.*
 2. B. prismaticus, *Celestine.*
 3. B. obliquus, *Baryto-calcite.*
 4. B. fusilis, *Witherite.*
 5. B. rhombohedrus, *Dreelite.*
 6. B. ponderosus. *Heavy spar.*

Genus 2. SPANIALUS.‡

H=4—5. G=3.4—4.8.

- Sp. 1. S. hexagonus, *Fluorine.*
 2. S. dodecahedrus, *Subsesquifluat of Cerium.*
 3. S. quadratus, *Carbonate of Cerium.*
 4. S. Wollastonii, *Silicate of Cerium.*
 5. S. octahedrus, *Microlite.*
 6. S. rhombicus, *Ytthro-cerite.*
 7. S. peritomus, *Xenotime.*

Genus 3. SCHEELIUS.

H=4—4.5. G=6—6.1.

- Sp. 1. S. pyramidalis, *Tungstate of lime.*

Genus 4. STIMMIUS.§

H=2.5—3. G=5.5—5.6. Contain antimony.

- Sp. 1. S. rhombicus, *White antimony.*

Genus 5. BISMUTALUS.

H=3—4.5. G=5.9—6.1. Contain bismuth.

- Sp. 1. B. ochraceus, *Bismuth-Ochre.*
 2. B. dodecahedrus, *Bismuth-Blende.*

Genus 6. ZINCALUS.

H=2.5—5.5. G=4.3—4.5. Contain zinc.

- Sp. 1. Z. rhombohedrus, *Calamine.*
 2. Z. peritomus, *Electric Calamine.*
 3. Z. acrotomus, *Willemite.*
 4. Z. diatomus, *Hopeite.*

* Βάρος, weight, and ἄλς, salt.

† In allusion to its tinging flame red.

‡ Σπάνιος, rare, and ἄλς; the species are salts of two rare minerals, cerium and yttrium.

§ Στίμμι, antimony.

Genus 7. MARANTALUS.*

H=3-6 G=3-3.9. Color darkened on exposure. Contain manganese and iron.

- Sp. 1. M. rhombohedrus, *Spathic Iron.*
 2. M. rhombicus, *Junkerite.*
 3. M. decrepitans, *Diallogite.*
 4. M. quadratus, *Triphite.*
 5. M. Fresnii, *Hctepozite.*
 6. M. fusilis, *Huraulite.*

Genus 8. AREALUS.†

H=1.5-5. G=2.6-3.8. Contain iron.

- Sp. 1. A. cubicus, *Cube Ore.*
 2. A. trimetricus, *Scorodite.*
 3. A. Argentiiferus, *Chenocoprolite. D.*
 4. A. rhombicus, *Triphiline.*
 5. A. radiatus, *Cacoxenite.*
 6. A. rhomboideus, *Vivianite.*
 7. A. divergens, *Anglarite.*
 8. A. rhombohedrus, *Pyrosmalite.*
 9. A. foliaceus, *Cronstedtite.*

Genus 9. COBALTALUS.

H=1.5-2. G=3. Color some shade of red. Contain cobalt.

- Sp. 1. C. rubellus, *Cobalt-Bloom.*

Genus 10. CRONALUS.‡

H=2-4.5 G=5.3-8.1. Color white, green, blue, or red. Contain lead.

- Sp. 1. C. rhombicus, *White Lead.*
 2. C. quadratus, *Corneous Lead.*
 3. C. Vesuvianus, *Cotunnite.*
 4. C. peritomus, *Cerasite.*
 5. C. acrotomus, *Leadhillite.*
 6. C. flexilis, *Dyoxytite.*
 7. C. Angleseanus, *Anglesite.*
 8. C. amorphus, *Hedyphane.*
 9. C. resiniformis, *Plumbo-resinite.*
 10. C. hexagonus,
 11. var. 1. speciosus, *Pyromorphite.*
 12. var. 2. alliaceus, *Mimetene.*
 13. C. pyramidalis, *Molybdate of Lead.*
 14. C. Vanadicus, *Vanadate of Lead.*

* *Mapaiwa*, to fade, alluding to the change of color the species undergo on exposure.

† *Αρης*, Mars, the alchemistic name of iron; and *αλς*, salt.

‡ *Κρόνος*, Saturn, the alchemistic name of lead, and *αλς*, salt.

- Sp. 15. *C. ponderosus*, *Tungstate of Lead.*
 16. *C. hyacinthus*, *Chromate of Lead.*
 17. *C. rubeus*, *Melanochroite.*
 18. *C. Vauquelini*, *Vauquelinite.*
 19. *C. diatomus*, *Caledonite.*
 20. *C. rhomboideus*, *Cupreous Anglesite.*
 21. *C. ochraceus*, *Minium.*

Genus 11. *CYPRALUS*.*

H=1—4.5. G=2.5—4.3. *Color green or blue. Contain copper.*

- Sp. 1. *C. acrotomus*, *Aphanesite.*
 2. *C. cœruleus*, *Blue Malachite.*
 3. *C. vulgaris*, *Green Malachite.*
 4. *C. amorphus*, *Chrysocola.*
 5. *C. rhombohedrus*, *Dioptase.*
 6. *C. speciosus*, *Euchroite.*
 7. *C. concentricus*, *Erinite.*
 8. *C. rectangulus*, *Liroconite.*
 9. *C. hemihedrus*, *Pseudo-malachite.*
 10. *C. dystomus*, *Libethenite.*
 11. *C. acicularis*, *Olivenite.*
 12. *C. exhalans*, *Atacamite.*
 13. *C. foliaceus*, *Copper-Mica.*
 14. *C. decrepitans*, *Copper-Froth.*

Genus 12. *NICCALUS*.

H=2—2.5. *Contain nickel.*

- Sp. 1. *U. prasinus*, *Nickel Green.*
 2. *U. Herreri*, *Herrerite.*

Genus 13. *URANALUS*.

H=2—3. G=3.1—3.2. *Contain uranium*

- Sp. 1. *U. ochraceus*, *Uranic ochre.*
 2. *U. quadratus*, *Uranite.*

ORDER III. *CERATINEA*.

Genus *CERATUS*.

H=1—2. G=5.5—6.5.

- Sp. 1. *C. cubicus*, *Horn Silver.*
 2. *C. quadratus*, *Horn Quicksilver.*
 3. *C. foliatus*, *Iodic Silver.*

* *Κόπρος*, copper, and *ἅλς*, salt.

ORDER IV. OSMERINEA.

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Genus 1. HYDROLUS.*

H=1—3.5. G=1.4—2.1. *Fusion difficult—infusible.*

- | | |
|----------------------|----------------------|
| Sp. 1. H. cerinus,† | <i>Halloylite.</i> |
| 2. H. argilliformis, | <i>Kollyrite.</i> |
| 3. H. adhærens, | <i>Scarbrite.</i> |
| 4. H. pyrosmicus,‡ | <i>Pyrargillite.</i> |
| 5. H. Gibbsianus, | <i>Gibbsite.</i> |
| 6. H. tinctus, | <i>Allophane.</i> |

Genus 2. OPHITIS.‡

H=2—4. G=2.5—2.9.

- | | |
|---------------------|----------------------|
| Sp. 1. O. communis, | <i>Serpentine.</i> |
| 2. O. figularis, | <i>Agalmatolite.</i> |
| 3. O. reniformis, | <i>Kerolite.</i> |

Genus 3. STYLUS.||

H=2—3. G=2.6.—2.8. *In prisms of six or twelve sides.*

- | | |
|----------------------|------------------|
| Sp. 1. S. hexagonus, | <i>Pinite.</i> |
| 2. S. acrotomus, | <i>Fahlnite.</i> |

Genus 4. NEMATUS.¶

H=2—3. G=2.3—2.7. *Delicately columnar.*

- | | |
|------------------------|--------------------|
| Sp. 1. N. rectangulus, | <i>Picrosmine.</i> |
| 2. N. scopiformis, | <i>Osmelite.</i> |
| 3. N. gracilis, | <i>Nemalite.</i> |

Genus 5. MARGARITUS.**

H=1.5—3. G=2—3.1. *Lamellar.*

- | | |
|-----------------------|-------------------------|
| Sp. 1. M. Magnesicus, | <i>Native Magnesia.</i> |
| 2. M. saponaceus, | <i>Talc.</i> |

* Υδωρ, *water*; refers to the large proportion of water in the species.

† Waxy, in allusion to its lustre.

‡ Πῶς, *fire*, and οσμή, *odor*.§ An old name of serpentine, derived from the Greek, ὄφις, *a snake*.|| Στελος, *a column*, in allusion to the hexagonally prismatic forms presented by the species.¶ Νῆμα, *a thread*; refers to the columnar structure of the species.** Μαργαρίτις, *pearl*; alludes to the lustre.

ORDER V. CHALICINEA.

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Genus 1. MICA.

H=2—4.5. G=2.6—3.1. *Structure highly foliated.*

- | | |
|-------------------------------|---------------------|
| Sp. 1. <i>M. margarina</i> *, | <i>Margarite.</i> |
| 2. <i>M. hexagona</i> , | <i>Black Mica.</i> |
| 4. <i>M. obliqua</i> , | <i>Common Mica.</i> |

Genus 2. PHYLLINIUS.†

H=3.5—6. G=2.6—3.4. *Structure foliated.*

- | | |
|------------------------------|-----------------------|
| Sp. 1. <i>P. Schilleri</i> , | <i>Schiller Spar.</i> |
| 2. <i>P. æreus</i> , | <i>Bronzite.</i> |
| 3. <i>P. Seybertianus</i> , | <i>Seybertite.</i> |
| 4. <i>P. metallinus</i> , | <i>Hypersthene.</i> |

Genus 3. VULCANUS.‡

H=3.5—6. G=2—2.7. *Species volcanic or amygdaloidal, sometimes granitic.*

- | | |
|--------------------------------|---------------------|
| Sp. 1. <i>V. rhomboideus</i> , | <i>Heulandite</i> |
| 2. <i>V. fascicularis</i> , | <i>Stilbite.</i> |
| 3. <i>V. Thomsonianus</i> , | <i>Thomsonite.</i> |
| 4. <i>V. hemiquadratus</i> , | <i>Edingtonite.</i> |
| 5. <i>V. rhombicus</i> , | <i>Natrolite.</i> |
| 6. <i>V. peritomus</i> , | <i>Mesotype.</i> |
| 7. <i>V. crispans</i> , | <i>Scolezite.</i> |
| 8. <i>V. stramineus</i> , | <i>Carpholite.</i> |
| 9. <i>V. tenax</i> , | <i>Dysclasite.</i> |
| 10. <i>V. acutus</i> , | <i>Epistilbite.</i> |
| 11. <i>V. Brewsterianus</i> , | <i>Brewsterite.</i> |
| 12. <i>V. flabelliformis</i> , | <i>Mesolite.</i> |
| 13. <i>V. Comptonianus</i> , | <i>Comptonite.</i> |
| 14. <i>V. quadratus</i> , | <i>Apophyllite.</i> |
| 15. <i>V. efflorescens</i> , | <i>Laumonite.</i> |
| 16. <i>V. gemellus</i> , | <i>Harmotome.</i> |
| 17. <i>V. Philipsianus</i> , | <i>Philipsite.</i> |
| 18. <i>V. cubicus</i> , | <i>Analcime.</i> |
| 19. <i>V. dodecahedrus</i> , | <i>Sodalite.</i> |
| 20. <i>V. trapezohedrus</i> , | <i>Leucite.</i> |
| 21. <i>V. rhombohedrus</i> , | <i>Chabazite.</i> |
| 22. <i>V. Levyanus</i> , | <i>Levyne.</i> |
| 23. <i>V. exfolians</i> , | <i>Gmelinite.</i> |
| 24. <i>V. dystomus</i> , | <i>Datholite.</i> |

* Alludes to the pearly lustre.

† Φάλλον, a leaf, in allusion to the foliated structure of the species.

‡ Refers to the occurrence of the species in rocks of igneous origin.

Genus 4. CLASISTYLUS.*

H=6—6.5. G=2.8—3. Color light-green; colorless. Commonly botryoidal.

- Sp. 1. C. acrotomus, *Prehnite*.

Genus 5. NEPHRUS.

H=5.5—7. G=2.9—3.4. Massive.

- Sp. 1. N. amorphus, *Nephrite*.
2. N. peritomus, *Saussurite*.

Genus 6. PETALUS.

H=6—6.5. G=2.4—2.5. Massive.

- Sp. 1. P. rhombicus, *Petalite*.

Genus 7. LAZULUS.

H=5—6. G=2.8—3.1. Color blue or green. Cleavage indistinct.

- Sp. 1. L. amorphus, *Turquoise*.
2. L. rhombicus, *Lazulite*.
3. L. triclinatus, *Blue Spar*.

Genus 8. SPATUM.

H=4—6.5. G=2.1—3.1.

- Sp. 1. S. hexagonum, *Nepheline*.
2. S. Herschellianum, *Herschellite*.
3. S. oleaceum, *Elæolite*.
4. S. opalescens, *Labradorite*.
5. S. orthotomum,† *Feldspar*.
6. S. gemellum, *Pericline*.
7. S. triclinatum, *Albite*.
8. S. Vesuvianum, *Anorthite*.
9. S. roseum, *Latrobite*.
10. S. quadratum, *Scapolite*.
11. S. Gehlenianum, *Gehlenite*.
12. S. volcanicum, *Gismondine*.

Genus 9. SPATINIUS.

H=5.5—6.5. G=3—3.5.

- Sp. 1. S. decolorans, *Manganese-Spar*.
2. S. rhombohedrus, *Troostite*.
3. S. reniformis, *Bustamite*.

* Κλάω, to break, and στήλος, a column, in allusion to the resemblance to a broken column, often presented by the crystals of this species.

† 'Ορθός, straight, and τέμνω, I cleave, refers to the fact, that its two cleavages are at right angles with one another.

Genus 10. **Augitus.**

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H=5-7. G=2.9-4.

- | | |
|----------------------|-----------------------|
| Sp. 1. A. tabularis, | <i>Tabular Spar.</i> |
| 2. A. rhombicus, | <i>Spodumene.</i> |
| 3. A. diatomus, | <i>Pyroxene.</i> |
| 4. A. dystomus, | <i>Bucklandite.</i> |
| 5. A. acrotomus, | <i>Babingtonite.</i> |
| 6. A. Protæus, | <i>Hornblende.</i> |
| 7. A. phyllinus, | <i>Anthophyllite.</i> |
| 8. A. scopiformis, | <i>Cumingtonite.</i> |
| 9. A. peritomus, | <i>Arfvedsonite.</i> |
| 10. A. rhomboideus, | <i>Epidote.</i> |
| 11. A. Withami, | <i>Withamite.</i> |
| 12. A. cuspidatus, | <i>Acmite.</i> |
| 13. A. Lithicus, | <i>Amblygonite.</i> |

ORDER VI. **HYALINEA.**

Genus 1. **ANDALUSIUS.**

H=7-7.5. G=3.1-3.2.

- | | |
|------------------------|--------------------|
| Sp. 1. A. prismaticus, | <i>Andalusite.</i> |
|------------------------|--------------------|

Genus 2. **EPIMECIUS.***

H=6-7. G=3.1-3.7. *Crystals usually long and slender. Color blue-brown-white.*

- | | |
|----------------------|---------------------|
| Sp. 1. E. cyaneus, | <i>Kyanite.</i> |
| 2. E. dissiliens,† | <i>Diasporc.</i> |
| 3. E. Sillimanianus, | <i>Sillimanite.</i> |
| 4. E. Bucholzianus, | <i>Bucholzite.</i> |

Genus 3. **TURMALUS.**

H=6.5-8. G=3.-3.4. *Color black-dark-brown-dark-blue-green-red-white.*

- | | |
|-------------------------|--------------------|
| Sp. 1. T. rhombohedrus, | <i>Tourmaline.</i> |
|-------------------------|--------------------|

Genus 4. **BERYLLUS.**

H=7.5-8 G=2.8-3.1. *Color green-bluish-colorless.*

- | | |
|----------------------|-------------------|
| Sp. 1. B. hexagonus, | <i>Beryl.</i> |
| 2. B. rhomboideus, | <i>Euclase.</i> |
| 3. B. rhombohedrus, | <i>Phenacite.</i> |

* *Επιμηκης, very long.*

† *Flying in pieces*; alludes to the action under the blowpipe.

Genus 5. SAPPHIRUS.

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H=7.5—9. G=3.5—4.6.

- Sp. 1. S. rectangula, *Chrysoberyl.*
 2. S. octahedra, *Spinel.*
 3. S. eutoma, *Automolite.*
 4. S. infusilis, *Dysluite.*
 5. S. rhombohedra, *Sapphire.*

Genus 6. ADAMAS.

H=10. G=3.1—3.8.

- Sp. 1. A. octahedrus, *Diamond.*

Genus 7. TOPAZIUS.

H=8. G=3.4—3.6.

- Sp. 1. T. rhombicus, *Topaz.*
 2. T. Vesuvianus, *Forsterite.*

Genus 8. CHRYSOLITHUS.

H=6.5—7.5. G=3.3—3.5.

- Sp. 1. C. rectangulus, *Chrysolite.*
 2. C. obliquus, *Ligurite.*

Genus 9. HYALUS.

H=5.5—7. G=2—3.3.

- Sp. 1. H. bicolor, *Iolite.*
 2. H. acutus, *Axinite.*
 3. H. rhombohedrus, *Quartz.*
 4. H. opalinus, *Opal.*
 5. H. Vulcani, *Obsidian.*
 6. H. sphærus, *Sphærolite.*
 7. H. feriferus, *Isopyre.*

Genus 10. BORACIUS.

H=7. G=2.9—3. Crystals monometric. Color white or gray.

- Sp. 1. B. hemihedrus, *Boracite.*

Genus 11. CARBUNCULUS.

H=6.—7.5. G=2.9—4.8.

- Sp. 1. C. hemihedrus, *Helvin.*
 2. C. obliquus, *Brucite.*
 3. C. acrotomus, *Humite.*
 4. C. dimetricus, *Idocrase.*

- Sp. 5. C. dodecahedrus, *Garnet.*
 6. C. quadratus, *Zircon.*
 7. C. rhombohedrus, *Eudialyte.*
 8. C. decussatus,* *Staurotide.*
 9. C. rhombicus, *Ostranite.*

ORDER VII. SCAPTINEA.

Genus 1. RUTILUS.†

H=3.5—7. G=3.2—6. *Color dark-red—brownish-black.*

- Sp. 1. R. Brucii, *Red Zinc Ore.*
 2. R. quadratus, *Rutile.*
 3. R. obliquus, *Sphene.*
 4. R. pyramidalis, *Anatase.*
 5. R. Brookianus, *Brookite.*
 6. R. octahedrus, *Red Copper Ore.*
 7. R. dystomus, *Pyrochlore.*

Genus 2. JOVIUS.‡

H=6—7. G=6.5—7.1. *Contain tin.*

- Sp. 1. J. quadratus, *Tin Ore.*

Genus 3. CERITUS.

H=5.5—6. G=3.1—3.2. *Contain cerium.*

- Sp. 1. C. rhombohedrus, *Cerite.*
 2. C. rhombicus, *Thulite.*

Genus 4. MELANOPHÆUS.§

H=2.5—6.5. G=2.1—5.6. *Color brown—black.*

- Sp. 1. M. triclinatus, *Allanite.*
 2. M. Thoriferus, *Thorite.*
 3. M. acicularis, *Orthite.*
 4. M. flammans, *Pyrorthite.*
 5. M. obliquus, *Gadolinite.*
 6. M. Laugier, *Titaniferous Cerite.*
 7. M. Mengianus, *Æschynite.*

* Crossed like the letter X; alludes to the commonly cruciform crystallization of this species.

† Red and shining.

‡ From Jupiter, the alchemistic name of tin.

§ Μέλας, black, and φαίς, brown.

- Sp. 8. *M. quadratus*, *Ørstedite*.
 9. *M. rectangulus*, *Polymignite*.

Genus 5. COLUMBUS.

H=5.5—6. G=5.8—8. Contain columbium.

- Sp. 1. *C. hemiquadratus*, *Fergusonite*.
 2. *C. Berzelii*, *Yttrio-Columbite*.
 3. *C. rectangulus*, *Columbite*.

Genus 6. URANIUS.

H=5.5. G=6.4—6.5. Contain uranium.

- Sp. 1. *U. amorphus*, *Pitchblende*.

Genus 7. WOLFRAMIUS.

H=5—5.5. G=7.1—7.4. Contain tungsten.

- Sp. 1. *W. rectangulus*, *Wolfram*.

Genus 8. MANGANUS.

H=1—6.5. G=3.1—4.9. Contain manganese.

- Sp. 1. *M. acrotomus*, *Hausmannite*.
 2. *M. peritomus*, *Braunite*.
 3. *M. informis*, *Psilomelane*.
 4. *M. Cupriferus*, *Cupreous Manganese*.
 5. *M. rhombicus*, *Manganite*.
 6. *M. prismaticus*, *Pyrolusite*.
 7. *M. Cobalticus*, *Earthy Cobalt*.
 8. *M. terrenus*, *Wad*.

Genus 9. SIDERUS.*

H=4—6.5. G=5.2—5.3. Contain iron.

- Sp. 1. *S. Chromicus*, *Chromic Iron*.
 2. *S. fibrosus*, *Crocidolite*.
 3. *S. Hisingeri*, *Hisingerite*.
 4. *S. rhombicus*, *Yenite*.
 5. *S. hæmaticus*,† *Brown Iron Ore*.
 6. *S. rhombohedrus*, *Specular Iron*.
 7. *S. octahedrus*, *Magnetic Iron Ore*.
 8. *S. Zinciferus*, *Franklinite*.

* Σίδηρος, iron.

† *Αἱματικός, bloody, in allusion to the color of the powder.

- Sp. 9. S. acrotomus, *Crichtonite*.
 10. S. Mohsianus, *Mohs site*.

ORDER VIII. METALLINEA.

Genus 1. FERRUM.

- Sp. 1. F. octahedrum, *Iron*.

Genus 2. PLATINUM.

- Sp. 1. P. cubicum, *Platinum*.

Genus 3. IRIDIUM.

- Sp. 1. I. hexagonum, *Iridium*.

Genus 4. PALLADIUM.

- Sp. 1. P. octahedrum, *Palladium*.
 2. P. rhombicum, *Selen-palladite*.

Genus 5. AURUM.

- Sp. 1. A. cubicum, *Gold*.
 2. A. rhombicum, *Auro-tellurite*.

Genus 6. ARGENTUM.

- Sp. 1. A. octahedrum, *Silver*.

Genus 7. HYDRARGYRUM.

- Sp. 1. H. fluidum, *Mercury*.
 2. H. dodecahedrum, *Amalgam*.

Genus 8. PLUMBUM.

- Sp. 1. P. octahedrum, *Lead*.

Genus 9. BISMUTUM.

- Sp. 1. B. octahedrum, *Bismuth*.
 2. B. Argenticum, *Bismuth-Silver*.

Genus 10. CUPRUM.

- Sp. 1. C. octahedrum, *Copper*.

Genus 11. TELLURIUM.

- Sp. 1. *T. hexagonum*, *Tellurium*.

Genus 12. STIBIUM.

- Sp. 1. *S. rhombohedrum*, *Antimony*.
 2. *S. rhombicum*, *Antimonial Silver*.

Genus 13. ARSENIUM.

- Sp. 1. *A. rhombohedrum*, *Arsenic*.

ORDER IX. PYRITINEA.

Genus 1. ARGYRITES.*

H=4—5.5. G=6—9.4. Color white, or slightly reddish.

- Sp. 1. *A. Argenteus*, *Arsenical Silver*.
 2. *A. eutomus*, *Nickel-Stibine*.
 3. *A. hexagonus*, *Antimonial Nickel*.
 4. *A. cupricolor*, *Copper-Nickel*.
 5. *A. Hoffmanni*, *White Nickel*.
 6. *A. decrepitans*, *Nickel-Glance*.
 7. *A. acrotomus*, *Leucopyrite*.
 8. *A. peritomus*, *Mispickel*.
 9. *A. octahedrus*, *Smaltine*.
 10. *A. hemi-cubicus*, *Cobaltine*.
 11. *A. Karsteni*, *Terarsenid of Cobalt*.
 12. *A. cubicus*, *Cobaltic Pyrites*.
 13. *A. Manganicus*, *Arsenid of Manganese*.

Genus 2. PYRITES.

H=3—6.5. G=4.5—6.1. Yellowish—yellow.

- Sp. 1. *P. hexagonus*, *Magnetic Pyrites*.
 2. *P. rhombicus*, *White Iron-Pyrites*.
 3. *P. cubicus*, *Iron-Pyrites*.
 4. *P. alliaceus*, *Arsenid of Copper*.
 5. *P. erubescens*,† *Variegated Pyrites*.
 6. *P. pyramidalis*, *Copper-Pyrites*.
 7. *P. capillaris*, *Capillary Pyrites*.

* *Αργυρος*, silver; refers to the color.

† *Blushing*; alludes to the reddish tarnish the mineral speedily assumes on exposure.

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ORDER X. GALINEA.

Genus 1. CYPRITES.*

H=2.5—4. G=4.3—5.8. *Contain copper.*

- | | |
|---------------------|-------------------------|
| Sp. 1. C. cubicus, | <i>Tin-Pyrites.</i> |
| 2. C. tetrahedrus, | <i>Gray Copper.</i> |
| 3. C. rectangulus, | <i>Bournonite.</i> |
| 4. C. dodecahedrus, | <i>Tennantite.</i> |
| 5. C. rhombicus, | <i>Vitreous Copper.</i> |

Genus 2. LUNITES.†

H=1.5—1.4. G=5.5—8.5. *Contain silver.*

- | | |
|----------------------|------------------------------------|
| Sp. 1. L. Selenicus, | <i>Eucairite.</i> |
| 2. L. Cupricus, | <i>Stromeyerite.</i> |
| 3. L. dodecahedrus, | <i>Vitreous Silver.</i> |
| 4. L. Telluricus, | <i>Telluric Silver.</i> |
| 5. L. Auricus, | <i>Graphic Tellurium.</i> |
| 6. L. rhombohedrus, | <i>Polybasite.</i> |
| 7. L. rhombicus, | <i>Brittle Silver Ore.</i> |
| 8. L. peritomus, | <i>Antim. Sulphuret of Silver.</i> |
| 9. L. Molybdicus, | <i>Molybdic Silver.</i> |

Genus 3. LYCITES.‡

H=2—3.5. G=4.5—5.8. *Contain antimony.*

- | | |
|---------------------|----------------------------|
| Sp. 1. L. diatomus, | <i>Gray Antimony.</i> |
| 2. L. Berthieri, | <i>Berthierite.</i> |
| 3. L. Zinkeni, | <i>Zinkenite.</i> |
| 4. L. acrotomus, | <i>Jamesonite.</i> |
| 5. L. alliaceus, | <i>Arsenical Antimony.</i> |

Genus 4. PLUMBITES.

H=1.5—3. G=6.8—8.5. *Contain lead.*

- | | |
|--------------------|-------------------------|
| Sp. 1. P. cubicus, | <i>Galena.</i> |
| 2. P. Cobalticus, | <i>Cobaltic Galena.</i> |
| 3. P. Selenicus, | <i>Clausthalite.</i> |

* *Κίτρος*, copper.

† From *Luna*, the alchemistic name of silver.

‡ *Λύκος*, a wolf; gray antimony was called "lupus metallorum," by the alchemists.

Genus 5. ELASMITES.*

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 H=1—1.5. G=4.2.—8.2. Structure foliated.

- Sp. 1. E. quadratus, *Foliated Tellurium.*
 2. E. rhombicus, *Sternbergite.*
 3. E. rhomboideus, *Flexible Silver.*
 4. E. hexagonus, *Molybdenite.*

Genus 6. BISMITES.†

H=2—2.5. G=6.1—7.6. Very fusible. Contain bismuth.

- Sp. 1. B. rectangulus, *Sulphuret of Bismuth.*
 2. B. acicularis, *Acicular Bismuth.*
 3. B. rhombohedrus, *Telluric Bismuth.*

Genus 7. ZINCITES.

G=5.5.—5.6. Contain zinc.

- Sp. 1. Z. flammans, *Rionite.*

ORDER XI. ADELINIA.

Genus 1. ACARPIA.‡

H=3.5—4. G=3.9—4.1.

- Sp. 1. A. cubica, *Manganblende.*
 2. A. dodecahedra, *Blende.*

Genus 2. CERASIA.§

H=1—1.5. G=4.5—4.6.

- Sp. 1. C. rhomboidea, *Red Antimony.*

Genus 3. RUBELLA.

H=2—2.5. G=5.2—8.1.

- Sp. 1. R. obliqua, *Miargyrite.*
 2. R. rhombohedra, *Dark-Red Silver.*
 3. R. florida, *Light-Red Silver.*
 4. R. peritoma, *Cinnabar.*

* *Ελασμα*, a plate of metal.

† Contracted from bismutites, which is derived from bismutum, the Latin of bismuth.

‡ *Ακαρπος*, sterile; alludes to the difficulty of reducing the species to the metallic state.

§ *Cerasus*, the cherry tree; in allusion to the color.

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Genus 4. EUCHROA.*

H=1.5—2. G=3.4—3.7.

- Sp. 1. E. rubella, *Realgar.*
2. E. aurea, *Orpiment.*

ORDER XII. THEIINEA.

Genus 1. SULPHUR.

- Sp. 1. S. pyramidalis, *Native Sulphur.*

CLASS III.—HYPOGÆA.

ORDER I. PITTINEA.

Genus 1. MELLIS.

H=2—2.5. G=1.5—1.6. *Transparent—translucent. Color light.*

- Sp. 1. M. pyramidalis, *Mellite.*

GENUS 2. SUCCINUM.

H=2—2.5. G=1—1.1. *Transparent—translucent. Color light.*

- Sp. 1. S. Electrum, *Amber.*

Genus 3. STEATUS.†

G=0.65. *Whitish. Crystalline.*

- Sp. 1. S. acicularis, *Scheererite.*

Genus 4. BITUMEN.

H=0—2.5. G=0.8—1.2. *Amorphous. Solid individuals opaque, or sub-translucent.*

- Sp. 1. B. fragrans, *Retinite.*
2. B. flexile, *Mineral-Caoutchouc.*
3. B. commune, *Bitumen.*

* Εἰχρόος, *finely colored.*

† Στεάον, *fat.*

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ORDER II. ANTHRACINEA.

Genus 1. ANTHRAX.

Lustre unmetallic.

- Sp. 1. A. bituminosus, *Bituminous Coal.*
2. A. lapideus, *Anthracite.*

Genus 2. PLUMBAGO.

Lustre metallic.

- Sp. 1. P. scriptoria, *Graphite.*

REMARKS *on the Structure and Affinities of the Order*
CERATOPHYLLACEÆ. *By* ASA GRAY, M. D.

Read, February 20, 1837.

THE fruit and seed of the genus *Ceratophyllum*, *Linn.* were first correctly described and figured by Gærtner,* so long ago as the year 1778; a fact worthy of especial notice, since an erroneous view respecting the structure of the seed has been introduced into every subsequent systematic work that has fallen under my notice, in which an account of that organ is attempted. The only error in the description of Gærtner, is that of considering the proper cotyledons as a separate organ, which (in this as in a few analogous cases) he calls the *vitellus*; but it should be borne in mind that the admirable work of this author was prepared at a period when the nature of the embryo was very imperfectly understood.

L. C. Richard† first pointed out the most remarkable peculiarity in the structure of the embryo, which consists in the presence of four (apparent) cotyledons and a highly developed plumule. Jussieu,‡ who evidently knew very little of the genus, referred it to the order Naiades; a very heterogeneous assemblage as originally constituted, the twelve genera included in it having been since ascertained to belong to at least seven different families.

* *De Fruct. et Sem. Plantarum*, 1, p. 212, t. 44, fig. 2.

† *Analyse du Fruit*, 1808.

‡ *Gen. Plantarum*. p. 18.

The order *Ceratophyllaceæ*, indicated, perhaps, by Richard, was described, in the year 1821, by Samuel Frederick Gray, in a work entitled, *A Natural Arrangement of British Plants* ;* wherein it is correctly characterized, except that the radicle is said to be *superior*, i. e. to point towards the summit of the pericarp. Were this the case, it would necessarily follow, inasmuch as the seed is suspended, that the radicle should be turned towards the hilum, or, in other words, that the seed is *anatropous*; whereas, on the contrary, the ovule of *Ceratophyllum* is really *orthotropous*, and the radicle *inferior*.† This erroneous view would scarcely require such especial notice, since Gærtner has correctly described the seed in these respects,‡ were it not for the extraordinary fact of its inadvertent adoption in the *Prodromus* of De Candolle, the *Introduction to the Natural System* by Lindley, the *Ordines Plantarum* of Bartling, the last edition of the *Encyclopædia Britannica*,§ (as well as in the *Prodromus Floræ Peninsulae Indiæ Orientalis*) by Arnott, and also in the second and greatly improved edition of Dr. Lindley's *Introduction to the Natural System*, published within the past year. The genus has also been recently revised by Chamisso,|| and several new species indicated, but no notice whatever is taken of the structure of the ovule and seed.

It is not surprising that the true affinities of *Ceratophyllum* should have been overlooked, so long as its real structure was misunderstood in such an important particular. The author

* Vol. II. p. 554.

† This important mistake can scarcely be attributed to inadvertence, since in the Corrigenda at the end of the volume, the author adds, "seed upright, pendulous," which, instead of being a correction, is an additional error.

‡ "Semen fundo putaminis affixum . . . Embryo erectus. . . . Radicula intra vitellum abscondita, infera."—Gærtner, l. c.

§ Article Botany, p. 108.

|| *Linnaea*, 4, p. 503.

who first characterized the order, places it next to Haloragææ, in which he is followed by De Candolle, who arranges it between that family and Lythrarieæ, to which it is annexed by Arnott* as a sub-order; but no affinity with either has been shown, beyond a vague resemblance in habit. Bartling, and also Lindley, in the first edition of the work above cited, consider the affinities of the order to be wholly unknown, the latter, however, suggesting the query whether it be allied to Podagraceæ. In the succeeding edition, Dr. Lindley takes a new and wholly unexpected view, considering the genus as a sub-order, or degeneration, of Urticaceæ. I can perceive no particular resemblance between Ceratophyllum and Urticaceæ, except that the flowers of both are apetalous and diclinous, and the achenium one-seeded. It should be remarked, however, that the erect seed of the Urticeæ proper is orthotropous, as was first pointed out by Brown.† This is certainly the case in *Urtica*, *Boehmeria*, and *Parietaria*; but the fact has been somehow overlooked by Dr. Lindley, who expressly states, in the second edition of the *Introduction to the Natural System*, that the radicle in Urticaceæ always points to the hilum!

Our attention is next directed to some observations contained in the excellent and elaborate *Mémoire sur la Generation et le Développement de l'Embryon dans les Végétaux phanogames*, by Adolphe Brongniart,‡ which, as they have the merit

* "Much as these suborders (Lythrarieæ and Ceratophylleæ) differ in appearance, we have the authority of Richard for uniting them. It must be confessed, however, that their chief great resemblance is in the persistent calyx, free from, but surrounding the fruit."—*Arnott, l. c.*—I have never been so fortunate as to meet with the observation of Richard here alluded to.

† *Appendix to Capt. Tuckey's Expedition to Congo* (1806), p. 454.

‡ Read before the *Académie des Sciences* in December 1826, and published the succeeding year in the 12th volume of the *Annales des Sciences Naturelles*.

of being the only remarks extant which throw any light upon the true affinities of *Ceratophyllum*, have also the misfortune of having been wholly overlooked by succeeding systematic writers. Under these circumstances it is proper to quote that portion of the observations of M. Brongniart which have a direct bearing upon the subject under consideration. They relate, in part, to a remarkable peculiarity in the development of the embryo of *Ceratophyllum*, which is also inferred to occur in the genus *Nelumbium*.

“ Si on examine l'ovule du *Ceratophyllum demersum* au moment de la floraison, on trouve qu'il est suspendu au sommet de la cavité de l'ovaire, et qu'il est composé d'un seul tegument ouvert à l'extrémité opposée à son point d'insertion ; l'amande également suspendue est formée d'une membrane celluleuse, mince, transparente, et se termine par un mamelon court, formé par une sorte de petite couronne de cellules. Dans l'intérieur de cette amande, on trouve le sac embryonnaire (*the tercine* of Mirbel ?) qui la remplit en entier ; il est fixé supérieurement à la chalaze,”* &c. The passage above quoted suffices to show that M. Brongniart considers the ovule of *Ceratophyllum* as suspended and orthotropous, and the accompanying figures† so represent it. The author proceeds with an account of the embryo at its first development, when it appears as a minute green globule, situated, not within the nucule, but outside of it, and merely in contact with its orifice, from which the slightest force suffices to detach it.

“ Il continue à s'accroître pendant quelque temps en adhérant légèrement à l'extrémité du sac embryonnaire ; mais bientôt il s'en dégage et se développe dans la cavité comprise entre la membrane de l'amande et ce sac ; il se divise en trois lobes, les deux latéraux se prolongent sous forme de cornes

* *Ann. Sciences Naturelles*, 12, p. 251, et seq.

† *Op. cit.* t. 44.

entre le sac embryonnaire et les parois de l'amande ; le lobe moyen repousse le sac embryonnaire, s'introduit dans sa cavité, et finit par être ainsi enveloppé par le sac : il devient la gemmule composée de deux folioles inférieures opposées et de plusieurs verticilles d'autres feuilles plus petites.

" Il est inutile d'insister ici sur l'analogie qui existe entre cet embryon et celui du *Nelumbo*. Il est évident que les deux lobes externes sont analogues aux deux grands lobes arrondis de l'embryon du *Nelumbo*, que le sac qui enveloppe la gemmule est le même qui contient celle de cette plante, . . . enfin que la gemmule, très développée de ces deux plantes contient également une première paire des feuilles opposées, et en outre d'autres petites feuilles analogues pour les disposition aux autres feuilles de la plante."*

A remarkable resemblance being thus indicated between the embryo of *Ceratophyllum* and that of *Nelumbium*, it becomes important to learn whether a corresponding agreement exists as to the structure of the seed in other respects. Little or no information, however, is to be derived from systematic works respecting the situation of the seed in the pericarp, and the relation of the radicle to the hilum, in *Nelumbium*. The figures of Richard† and Gærtner‡ throw some light upon the question; but, on examination of the fruit, the radicle is at once perceived to be *inferior* and the seed *suspended*, and, consequently, *orthotropous*, as in *Ceratophyllum*. The points of agreement, therefore, between the two genera chiefly consist in the simple, one-seeded ovaries, the suspended, orthotropous, exalbuminous seeds, the large and fleshy cotyledons situated outside of the membrane of the nucule, and the unusually developed plumule (consisting of a pair of primordial leaves and

* *Op. cit.* p. 253.

† *Analyse du fruit*, t. 5, fig. 6; and *Ann. du Museum*, 17, t. 9, fig. 50 and 57.

Op. cit. 1, t. 19.

a bud) enveloped by the persistent membrane of the nucule. The points of difference, such as the want of petals, the nearly sessile anthers, and the single ovary of *Ceratophyllum*, are sufficiently obvious; but they cannot be thought to weaken materially such peculiar and strongly marked affinities. The lower degree of developement, both of the organs of vegetation and fructification of *Ceratophyllum*, are, perhaps, chiefly attributable to the entirely submersed habit of the genus.

If a comparison be next instituted between *Ceratophyllum* and the order Cabombaceæ or Hydropeltideæ, affinities will be perceived, the existence of which have been, I believe, hitherto unsuspected. This order, first indicated by Richard,* and considered by De Candolle as a tribe of Podophylleæ, has been referred to Nymphæaceæ both by Brown† and Lindley;‡ it is, however, a distinct order, more closely allied to Nelumbiaceæ than Nymphæaceæ, as will be shown in the course of these remarks. It includes two genera, both peculiar to the American continent, viz. *Brasenia*,§ the only species of which (*B. peltata* of Pursh) abounds in ponds and slow-flowing streams from Canada to Florida; and *Cabomba* of Aublet, which comprises two species hitherto confounded,|| the one a

* *Ann. du Museum*, 17, p. 230.

† *Appendix to Capt. King's Voyage to New Holland*.

‡ *Op. cit.* ed. 2, p. 13.

§ Schreber, *Genera Plantarum* (1798), p. 372.—*Hydropeltis*, Michx. fl. (1803) 1, p. 324. This genus having been characterized and described by Schreber long before the *Flora of Michaux* was published, I see no reason for adopting the name imposed by the latter, as is done by most European botanists.

|| I subjoin the characters and synonymy of the two species.

1. *CABOMBA AQUATICA*; foliis natantibus orbiculatis; floribus luteis; ovariis (an semper!) 2. — *C. aquatica*, *Aubl. pl. Guian.* 1, p. 321, t. 124; *Richard, ann. museum*, 17, p. 230, t. 5, fig. 23; *D C. syst.* 2, p. 36; *Dict. sci. nat. t. absque num.* (opt.); *Roem. & Schult. syst.* 7, p. 1379.—*HAB.* In stagnis et rivulis Cayennæ, *Aublet*; in Surinam, *Dr. Herring*.

native of Cayenne, the other of S. Carolina, Louisiana, &c. Both species have the habit of *Brasenia* as to the flowers and floating leaves, and that of *Ceratophyllum* in the filiformly dissected submersed foliage. *Brasenia* and *Cabomba* are very nearly allied; the principal difference consisting in the more numerous stamens and ovaries of the former, while in the latter the ovaries are reduced to two, three, or four, and the stamens are (as in *Ceratophyllum*) only twice the number of the sepals. The ovaries of both bear from two to three ovules, but commonly only one or two seeds are perfected. The indehiscent carpels are crowned with the persistent styles, as in *Ceratophyllum*.

In order to bring to view the real affinities of *Cabombaceæ*, it is necessary to avail ourselves of the important characters furnished by the seed, the true structure of which (particularly as compared with allied orders, in the direction of the radicle, &c.) has been almost wholly overlooked.* The seeds of *Cabomba* and *Brasenia* resemble each other very closely. They are suspended in the pericarp, one above the other, when two are present; and a rather large roundish spot (similar to that on the seed of *Nelumbium*) is observed at the extremity opposite the hilum; which, as no raphe is perceptible, may be inferred to be

2. *CABOMBA CAROLINIANA*; foliis natantibus ellipticis, lineari-oblongisve; floribus albis; ovariis 3—4.—C. Aubletii, *Michx. fl.* 1, p. 206. *Nectris peltata*, Pursh, *fl.* 1, p. 239 (*excl. syn.*). *N. aquatica*, Nutt. *gen.* 1, p. 230; *Ell. bot.* 1, p. 416, non Willd.—HAB. In aquis S. Carolinæ! Georgiæ! et Louisianæ!

I have seen flowers of this species with only two sepals, and two petals. Pursh, who considers the North American plant the same as that of Aublet, has, nevertheless, taken the unwarrantable liberty of changing the specific name.

* Fine dissections of the seed, both of *Cabomba* and *Brasenia*, drawn by Richard, are published in the plates of the *Dict. des Sciences Naturelles*, from an examination of which their true structure may be deduced. It is worthy of notice that the portion of the embryo which Richard calls the gemmule in *Ann. du Muséum* 17, p. 230, t. 5, fig. 32 and 23, he here more properly considers to be the radicle.

the micropyle. The correctness of this view is demonstrated by a consideration of their internal structure. The embryo, enclosed in a peculiar covering (the thickened and persistent membrane of the nucule) lies in immediate contact with the (organic as well as geometrical) base of the seed, the residue of the cavity being filled with a rather firm albumen; the radicular extremity pointing from the hilum and towards the distant micropyle. The seeds of *Cabombaceæ* are therefore *suspended* and *orthotropous*, as in *Ceratophyllaceæ*. The principal difference between the two orders, so far as respects the structure of the ovule and seed, consists, therefore, in the less developed embryo of the former being wholly enclosed in the persistent sac of the nucule (as in *Nymphæaceæ*), and in the presence of albumen. It is evident, therefore, that the order *Ceratophyllaceæ* is almost as closely allied to *Cabombaceæ* as to *Nelumbiaceæ*, and that it should stand in the immediate vicinity of these two orders, notwithstanding the much lower development of its floral organs, and other diversities attributable to its wholly submersed habit.

As to the affinity of the order *Cabombaceæ* with *Nelumbiaceæ* and *Nymphæaceæ*, it may be remarked that it agrees with the former in its innate anthers, apocarpous ovaries, and nearly solitary orthotropous seeds; and with the latter in the presence of albumen, and of a sac enclosing the embryo. It differs from *Nelumbiaceæ* chiefly in the albuminous seeds, and less developed embryo, and in the absence of an enlarged torus; while *Nymphæaceæ*, however close the alliance, are essentially distinguished from both these families by their adnate anthers, polyspermous and syncarpous ovaries, and *anatropous* seeds.*

* In both *Nymphæaceæ* and *Cabombaceæ* the embryo is commonly described as situated nearly without the albumen, at the base of the seed: there is, however, this important difference, that in the latter the embryo is placed at the true base of the seed, i. e. next the chalaza; while in the former (as in *Papaveraceæ*, &c.) it is situated at the ex-

The two species of *Ceratophyllum* admitted by Linnæus, were distinguished chiefly by the presence or absence of lateral spines. In a recent revision of the genus by Chamisso,* six species are described, and a seventh is indicated by Dr. Wallich. If these be distinct species, as is most probable, there are doubtless others to be discovered. In this country, specimens are rarely to be met with in fruit, and consequently the genus is little known. I am indebted to Dr. Torrey for the opportunity of examining specimens with ripe fruit, collected by him, several years since, near Princeton, New Jersey, which are wholly different from any species described or figured by Chamisso. They agree, however, with a specimen from Surinam, communicated by the late Mr. Schweinitz, except that the fruit is a little larger. This plant, which I am disposed to consider an undescribed species, resembles *C. muricatum* of Chamisso more than any other, from which it differs not only in the shorter and more slender terminal, and two lateral spines of the fruit, but also more particularly in the whole margin being beset with slender spines. It may therefore be called *C. echinatum*.

In descriptions of a seed, it is important that the relation of the hilum to the chalaza and micropyle should be especially noticed; or, which amounts to the same thing, that the *spermic*,

tremity opposite the chalaza or organic base, which, as in all anatropous seeds, occupies the geometrical apex of the seed. The radicle is approximated to the hilum in the former case, but points in the opposite direction in the latter. See a figure given by Dutrochet, in *Mem. du Muséum*, 8, t. 1, in which the embryo is plainly represented as dicotyledonous, although the author, adopting a very absurd view, attempts to prove it to be monocotyledonous. See also, especially, the admirable plate in the Memoir of Ad. Brongniart,* illustrative of the mode of impregnation, and the structure of the ovule and seed, in *Nuphar lutea*, which incontestably demonstrates the correctness of the view of Brown and others respecting the nature of the sac which encloses the embryo.

* *Ann. Sci. Naturelles*, 12, t. 29.

* *Linnaea* 4, p. 503.

rather than the *pericarpic* direction of the embryo should be particularly indicated; since the former affords characters of the highest rank, from which the latter may be inferred when considered in connexion with the direction of the seed. It is also desirable that the classification and nomenclature of ovules proposed by Mirbel* should be extended to seeds, and generally employed in systematic descriptions, which would thus be rendered much more simple and perspicuous. Thus, if we use the expression, *seed anatropous*, it is understood that the micropyle, and consequently the radicle, is situated in the immediate vicinity of the hilum, and that the chalaza, or organic base of the seed, occupies (if the embryo be straight, or nearly so,) the portion most remote from the hilum, with which it is connected by means of a prolongation of the funiculus, called the raphe.†

* *Ann. Sciences Naturelles*, vol. 17.

† An instance of the separation of the raphe from the testa, in one of the two seeds of the fruit of *Seringia platyphylla*, is represented by M. Gay in the seventh volume of the *Mem. du Muséum*, t. 17.

NOTICE of the Appearance of the PINE GROSEBEAK, *Pyrrhula
Enucleator*, in the Environs of New-York. By JAMES F.
WARD.

Read December 19, 1836.

THE Pine Grosbeak has been long known as an inhabitant of the extreme northern regions of both continents. Wilson records two solitary instances of their appearance in the neighbourhood of Philadelphia, but it seems to have been very rarely observed within the limits of the United States.

Mr. J. Bell and myself have met with this beautiful bird in abundance during the present season, (from October 1836 to March 1837,) not only at Weehawken, opposite to this city, but at Tappan, twenty miles farther north, and also on the south side of Long Island, many individuals having been exposed for sale in our markets, and they seem, in fact, to have spread themselves over the whole region, more particularly where the Red Cedar, *Juniperus Virginiana*, is to be found. We have never before met with them, though actively employed in collecting for ten years past, nor have we heard of their being seen here since more than twenty years ago, when, as we are informed by Mr. E. Guillaudet, he procured in the market the pair now preserved in the American Museum in this city. We can only account for their unusual appearance by the early cold weather, and the prevalence of northerly winds during several weeks past.

They appear to feed entirely on the hard kernel of the cedar berries, not, like other birds, swallowing the whole fruit. When feeding they are remarkably tame, so that we have frequently approached, at that time, within four feet of them. They are generally met with in small parties of from four to fifteen in

company. When shot at, or disturbed, they fly off in different directions, uttering a shrill loud note or call. When single they seem very restless, repeating their call incessantly. They are very active in pursuit of food, and are frequently seen fluttering upward after berries in the same manner as the common Cedar Bird.

Among our specimens, amounting to some hundreds, many of which we dissected to determine the sex, we have observed the following principal varieties :

1. Those with the plumage, above and below, principally of a bluish gray, with the crown and rump dark olive, approaching to orange. These we take to be the young of the year.

2. Those which have these parts crimson, except that the back feathers are merely bordered with this colour, the centre being dark. According to Temminck they are the males after their first moult.

3. Those which have scarlet instead of the crimson, the males after the second moult.

4. Those in which the crown is dark brown, the rump yellow-olive, and the back cinereous, and the head a mixture of cinereous and olive-green, and all exhibiting traces, more or less, evident of the cinereous plumage. From this last circumstance it would appear that they were males in the third year, though not answering to the description given by Temminck.

5. Those in which the brown parts of the last-mentioned are bright orange-brown, especially the rump, with scarcely a faint trace of red. This appears to be an old individual, and, from dissection, we are of opinion that it is an old female.

DESCRIPTIONS of *Five Species of VESPERTILIO* that inhabit the
Environs of the City of New-York. By WILLIAM COOPER.

Read February 6, 1837.

THE difficulty of determining the species of Bats is well known to zoologists. It is but recently that those belonging to Europe have been settled with some degree of accuracy, and it is not to be expected that the American species should be already so well known as to leave no room for further investigation. The *Mammalogie* of Desmarest, the latest general catalogue, contains descriptions of but three species from the continent of North America, those published by Rafinesque being considered by that author as too little known and too imperfectly described to be included in his text. Subsequent writers, especially Say, Le Conte, Harlan, have made known several others, so that the list of nominal species of Cheiroptera belonging to the United States now comprises thirteen, without including those of Rafinesque, or the *Rhinopoma carolinensis* of G. St. Hilaire, which has not been since observed, and is admitted by the author himself to be very doubtful as an American species. These thirteen species have been referred to the genera *Vespertilio*, *Nycticeius*, *Taphozous* and *Plecotus*.*

My object in the present communication is to establish and clear up the synonymy of several species which I have observed in this vicinity, and by means of more extended de-

* In a report on the Zoology of North America, read to the British Association by Dr. Richardson, at their late meeting in August 1836, he assigns sixteen species of Cheiroptera to North America. Not less than twenty-four have been described or indicated under separate names by authors, of which eleven are by Rafinesque.

scriptions and comparisons than have been heretofore given, to enable the student to determine them with as little difficulty as their close resemblance will permit. The materials for doing this have been derived partly from my own researches during several years past, and partly from the liberal communications of my friends, especially Major Le Conte of this city, the Rev. Dr. Bachman of Charleston, and Doctors Pickering and Morton of Philadelphia. Through their assistance I have likewise been enabled to make some interesting observations relative to other groups of this family, which I propose to communicate as I find opportunity to prepare them for publication. I hope in this manner to lay the groundwork for a complete account of the Cheiroptera of the United States, which however much to be desired, I have not at present the requisite materials to undertake.

1. *VESPERTILIO PRUINOSUS.*

Vespertilio pruinus, SAY in Long's Exp. I. p. 168. RICHARDSON, Fauna Bor. Am. I. p. 1.

Nycticeius tessellatus, RAF. ?

Hoary Bat, GODMAN, Am. Nat. Hist. I. p. 68. Pl. I. fig. 3. RICH. l. c.

Description.

In the general appearance of the upper parts it much resembles the common Red Bat, though more variegated in color. The ears are of moderate size and rounded, hairy above next the head, with a naked anterior lobe; the inside also hairy, except on the outer portion and round the border; tragus hairy, irregularly triangular, obtuse and arquated, with the outer angle curved forward and the inner attached. About the ears and front the color of the fur is a pale tawney, the remaining upper parts of the body including the flanks and interfemoral membrane, except a narrow edging round the latter, of a dark ferruginous, intermixed with dusky black on

the back, and all tipped with white, giving it a peculiarly hoary aspect. There is a small whitish hairy patch near the first or elbow joint of the wing membrane, and another at the base of the thumb, and in some, a third at the base of the fourth phalanx, the remainder of the membrane above being naked. Beneath, the lips and lower jaw are dusky black, throat and neck pale yellowish. At the insertion of the wings is a white mark as in *V. noveboracensis*, on each side, between which the fur is dusky brown tipped with white, like the upper parts. Lower down it becomes much mixed with pale tawney, which predominates on the flanks, and extends, forming a hairy border of half an inch wide up the membrane, to the origin of the phalanges. The remainder of the wing and interfemoral membranes naked.

The sides of the interfemoral membrane are sustained by a bony process (os calcis?) three fourths of an inch long, projecting in a curved line, and articulated with the tibia. This is not peculiar to the species, but is more than usually apparent.

$$\text{Incisors } \frac{1-1}{6} \quad \text{canines } \frac{1-1}{1-1} \quad \text{molars } \frac{4-4}{3-3} = 30.$$

Total length	- - - - -	4.8 inches.
Tail	- - - - -	1.8 "
Fore arm	- - - - -	2.0 "
Tibia	- - - - -	0.9 "
Spread	- - - - -	15.0 "

I have no doubt of the identity of this Bat with the *pruinatus* of Say, as well as of Richardson, who has described its external markings with minuteness and accuracy. The difference in size remarked by Dr. Richardson in his specimen is not greater than I have observed between different specimens of the smaller species; but the dental formula given by him, is materially unlike that which I, after repeated examination, have laid down as above. In fact, this and the following species agree strictly in all the peculiarities of their dental system,

both as to the kind and number of the teeth, and form together a small natural group, the *Nycticeius* of Rafinesque, which however I have not thought it expedient to adopt as a genus, as they differ so little in habit and external characters from our other *Vespertiliones*. The external resemblance between these two species is also very great, so that they might be confounded without a close inspection of the markings. But the Hoary Bat is much larger; besides, as Say observes, many minor differences, of which the most conspicuous are the black lips and chin, and buff-colored cravat of this species. The hairy patch near the elbow joint I have not found in any instance in the New-York Bat, and in all the varieties of this latter there is an obvious reddish tinge, approaching sometimes to lake, on the under parts (as well as upper) of which there is no appearance whatever in the large species. The white mark at the insertion of the wings is found in both.

Though first described by Mr. Say from a specimen obtained beyond the Mississippi, there is now reason to believe that this fine species is common in the Atlantic States. Previously to the expedition of Major Long it had been captured in Philadelphia, and a specimen from Georgia has been communicated to me by Major Le Conte, and another by Dr. Bachman from Charleston, South Carolina. That from which the above description is chiefly drawn up, was shot by Mr. J. F. Ward, in the month of November, near the heights of Weehawken, in New Jersey, near this city, in broad daylight. It was hovering and fluttering about the precipice in the manner of other Bats, and occasionally darting towards the low grounds, more like a bird. I have witnessed at the same locality the similar evolutions of a Bat, probably of this species, that was flying about early one fine afternoon, though it kept below the shadow of the rocks. It is not improbable that it migrates hither from the north, Dr. Richardson having met with it in lat. 54°.

2. *VESPERTILIO NOVEBORACENSIS*.

New-York Bat, PENN. SYN. p. 367. IDEM Arct. Zool. I. p. 184.
Vespertilio noveboracensis, GMEL. Syst. I. p. 50 sp. 21. GEOFFROY
 St. H. in ANN. MUS. S. p. 203. HARLAN, FARRA AM. IDEM,
 Month. AM. J. I. p. 220. GODMAN, AM. NAT. HIST. I. p. 68.
 Red Bat of PENN. WILS. AM. ORN. VI. pl. 50 p. 60.
Taphozous rufus, LESSON, MAN. MAMM.
Nycticeia noveboracensis, L. C. in APP. to Mc Murtrie's Cuvier,
 I. p. 441.

Description.

Ears short, roundish, naked on the anterior half above, and furnished merely with a thin covering of fine hairs within. Color of the fur above reddish tawney, in some individuals deep, and more properly ferruginous; in others very light-colored: the base is of a light ochreous tint, towards the end it is reddish tawney, ferruginous, or lake, and often finely tipped with white, giving it a slightly hoary or cream-colored appearance, according to the predominance of one or the other of these tints. The reddish tawney always predominates on the interfemoral membrane, which, and the feet, are densely hairy down to the very edge. The wing membranes are entirely naked above, with the exception of a small spot at the base of the thumb, and about the base of the fore finger, which in some individuals extends half an inch down each side of the phalanx, though in others there is scarcely a trace. At the insertion of the wings is a white mark, most conspicuous on the under side. Beneath, the colors are similar to those of the back, though paler; a hairy border extends along the anterior side of the membrane to the divergence of the phalanges. This part of the membrane is light yellow or tawney, while the rest is dusky both in this and the preceding species.

Incisors $\frac{1-1}{6}$ canines $\frac{1-1}{1-1}$ molars $\frac{4-4}{5-5} = 30$.

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Total length	- - - -	from	3.0	to	3.8 inches.
Tail, about	- - - -	"	1.3	"	1.5 "
Fore arm	- - - -	"	1.3	"	1.5 "
Tibia	- - - -	"	0.7	"	0.8 "
Spread	- - - -	"	10.0	"	11.0 "

There has been much disagreement among authors respecting the dental system of this Bat. Say first detected the error of Pennant, who thought it had no upper incisors. F. Cuvier is the only author who has given a complete dental formula for the species, but it is not correct.* Desmarest, following Rafinesque, arranges the *V. noveboracensis* under the genus *Atalapha*, characterized by the total absence of incisors! The above formula may be relied on, having been carefully verified by my own repeated examinations, and confirmed by the notes communicated by Major Le Conte.

The Red Bat of Pennsylvania, figured in the sixth volume of Wilson's Ornithology, is no other, as Godman has remarked, than this species, and one of the lighter colored varieties. Lesson, an industrious French naturalist, concluded from Wilson's account of its dental system, that it belonged to the African genus *Tuphozous*, in which he has been followed by Cuvier in his second edition, with what reason may be inferred from our description. In effect the incisors rise so little above the gum, and even in prepared skulls the lower are so minute and so crowded together, that the most careful inspection with a lens is requisite to detect the actual number.

The Red or New-York Bat is common over a great extent of country, including the southern and middle states, and the western to near the Rocky Mountains, where it was met with by Major Long's party. During winter it remains in a torpid state in caverns and similar places, where it has been found at

* Dents des Mammifères, p. 48.

this season in the States of New-York and Pennsylvania. In summer it is frequently discovered in woods suspended during the day by its thumb claws to a twig behind a cluster of leaves. Its habits are in other respects similar to those of its tribe. The female is larger than the male, and produces four or five young at a birth, though others of the genus are said to have but one.

V. borbonicus of Geoffroy is no doubt a very different species, as well as *V. lasiurus* of Schreber, also figured by Geoffroy, unless we suppose the ears to be very incorrectly represented by these authors.

3. *VESPERTILIO NOCTIVAGANS*.

Vespertilio noctivagans, L. C. in App. to Mc Murtrie's Transl. of Cuv. R. An. I. p. 431.

Vespertilio Auduboni, HARLAN, in Am. Monthly Jour. of Geol. p. 220. pl. IV.

Silver haired, or Audubon's Bat.

Description.

Ears dusky black, rather large, naked on the anterior portion, somewhat ovate and obtuse, with two emarginations on the outer posterior border, produced by two plaits; naked within, and with the tragus moderate, ovate, and obtuse. Color above, a uniform dark dusky brown approaching to black. On the back the fur is somewhat glossy and tipped with silvery white, forming an interrupted line across the shoulders, and thence irregularly mixed down the centre of the back. Inter-femoral membrane thickly hairy on the upper part, becoming thinner downward and naked near the border. Tip of the tail projecting about a line beyond the membrane. Feet hairy. Wing membrane entirely naked. Beneath very similar to the upper parts, though the light-colored tips of the hairs are more yellowish.

Incisors $\frac{2-2}{1-1}$ canines $\frac{1-1}{1-1}$ molars $\frac{5-5}{5-5} = 34$.

Total length	- - - - -	3.8 inches.
Tail	- - - - -	1.5 "
Fore arm	- - - - -	1.8 "
Tibia	- - - - -	0.8 "
Spread	- - - - -	11.0 "

This species is easily recognised at sight by its dark black-brown fur tipped with white on the back, and it cannot be confounded with any other of our Bats by the most heedless observer. It was first described in the year 1831, both by Major Le Conte and Dr. Harlan. The preface to the volume in which the former gentleman's description appears is dated in June; that of the latter is contained in the Journal of Geology for November of the same year. These dates are my only guide in deciding the claim to priority in favor of Major Le Conte, by adopting his name for this species.

The Silver-haired Bat is rare in our vicinity, and I have only obtained it from Long Island, where it is found during the day in hollow trees. I have seen a considerable number, which were remarkably uniform in their appearance. They are probably more common in the southern states, where they have been observed by Major Le Conte.

4. VESPERTILIO CAROLINENSIS.

Vespertilio carolinensis, GEOFFROY ST. HILAIRE, in Ann. du Museum, 8 p. 193, sp. 2. figs. of the head and cranium pls. 47 and 48. LE CONTE, in App. to Mc Murtrie's Cuv. I. p. 431.

Description.

Ears large, naked, except near the head, and with a broad and obtuse tip curving outwards; emarginate on the outer posterior edge, tragus nearly a line broad, linear and obtuse,

and as well as the inside of the ears, destitute of hairs. All the upper parts of the head and body are covered with close soft and glossy fur, of a uniform brown color approaching to chestnut. Beneath the fur is of a pale dingy ochreous or yellowish. The remaining parts are all naked with the exception of a few scattered hairs on the toes. Last joint of the tail free. Bony process supporting the membrane very apparent.

Incisors $\frac{2-2}{6}$ canines $\frac{1-1}{1-1}$ molars $\frac{4-4}{3-5} = 32$.

Total length	- - - - -	3.8 inches.
Tail	- - - - -	1.5 "
Fore arm	- - - - -	1.8 "
Tibia	- - - - -	0.8 "
Spread	- - - - -	11.5 "

Though apparently well known to the French naturalists, no American author who has written upon these animals appears to have been acquainted with this species, except Major Le Conte, as above cited. It is common in Carolina and Georgia, and rather numerous on the south side of Long Island, whence I have frequently procured it.

5. VESPERTILIO SUBULATUS.

Vespertilio subulatus, SAY in Long's Ex. II. p. 65. RICHARDSON Fauna B. A. I. p. 3.

Vespertilio lucifugus, L. C. in App. to Mc Murtrie's Cuv. I. p. 431. *Atalapha fuscata*, RAF. ?

Vespertilio domesticus, GREEN, in Cab. N. H. II. p. 290. Say's Bat, RICHARDSON loc. cit.

Description.

Ears rather large, naked except at the very base, narrowed somewhat at tip, and obtuse, tragus linear, subulate, subacute. The fur is fine and soft, of a grayish or cinereous brown color above, beneath pale yellowish mixed with dusky. The re-

maining parts are naked like the preceding species, the membranes more delicate in texture and less dusky, and the tail all engaged in the interfemoral membrane.

Incisors $\frac{2-2}{4}$ canines $\frac{1-1}{1-1}$ molars $\frac{6-6}{6-6} = 38$.

Total length	- - - - -	3.2 inches.
Tail	- - - - -	1.3 "
Fore arm	- - - - -	1.3 "
Tibia	- - - - -	0.7 "
Spread	- - - - -	9.3 "

Say's Bat, and the Carolina Bat have a strong external resemblance, and might be mistaken for each other, though there is considerable difference in size, which, with the different form of the tragus will enable the student to discriminate between the two species. The dental systems, it will be observed, are very unlike. That of *V. subulatus* is correctly described by Dr. Richardson, as I have carefully verified. From the specimens and MS. notes communicated to me by Major Le Conte, I am satisfied of the identity of this with his *V. lucifugus*, to which he also assigns the same dentary system.

This species, first made known by Mr. Say, in the notes to the account of Long's first expedition, was afterwards more minutely described by Dr. Richardson, who found it the most common species of Bat near the eastern base of the Rocky Mountains, and Mr. Townsend has recently brought it from Columbia river. A specimen obtained by Dr. Pickering in the mountains of New Hampshire, is preserved in the cabinet of the Academy of Natural Sciences, and I have seen another procured by Mr. Audubon, in Labrador. I have a specimen from Pittsburg, on the Ohio. In our vicinity, and in the city itself, it is pretty common. Major Le Conte, and Mr. Bachman, have communicated specimens from Georgia and Carolina. It is therefore, though one of the latest known, at the same time one of the most widely diffused over the United States.

Professor J. Green, has given in Doughty's Cabinet of Natural History some interesting particulars concerning a small species of Bat, *V. domesticus*, which appears from his description to be identical with this. He observed it to resort in great numbers to a deserted frame building, concealing itself during the day between the boards and the plaster walls, all entering and issuing by one small aperture. This was in western Pennsylvania.

I here wish to corroborate the remark of Professor Green, that the number of incisors, at least in our Bats, is a permanent character. I have seen nothing to favor the idea entertained by several distinguished naturalists, that any of the teeth are deciduous, but on the contrary have observed them to retain the entire number until quite worn with use.

On Two Species of MOLOSSUS inhabiting the Southern United States. By WILLIAM COOPER.

Read February 20, 1837.

THE great Prussian zoologist Pallas, in his *Spicilegia Zoologica*, Fascicle IV. p. 8, suggests the name of *Molossus* for a South American Bat, which had been previously made known by Buffon and Daubenton, giving at the same time a figure of the cranium, and pointing out some peculiarities in its dentary system which distinguished it from all the other then known species. Accordingly it became the *Vespertilio molossus* of Gmelin, in whose *Systema* it forms a distinct section, characterized as already indicated by Pallas.

M. Geoffroy St. Hilaire having undertaken a revision of the great genus *Vespertilio*, proposed in the sixth volume of the *Annales du Muséum*, the *V. molossus* of Pallas and Gmelin as the type of a separate group, for which he adopted the name of *Molossus*, and added several other species, all natives of South America. Illiger afterwards changed the name of this genus to *Dysopes*, which is also employed by M. Temminck in preference to the original name, but as the alteration seems to have been introduced without sufficient necessity, we shall with Cuvier adhere to that first proposed by Pallas.

This genus, extended so as to include the *Nyctinomus* of Geoffroy, forms the subject of an excellent memoir in the *Monographies de Mammalogie* of Temminck. *Nyctinomus* was originally founded on an Egyptian Bat, and the species were for a time supposed to be confined to Asia and Africa, until M. Geoffroy the younger himself referred to the same genus the *Molossus nasutus* of Spix, under the name of

Nyctinomus brasiliensis. The geographical distinction being thus done away with, and M. Temminck finding in the young *Molossi* all the characters of the *Nyctinomi* has united them in one. The *Dinops* of M. Savi, founded on a species observed in Italy, there appears reason to believe is also a species of *Molossus*, which thus proves to inhabit every quarter of the old continent.

The fact of the existence of this genus in North America, and especially so far north as the United States, has not been hitherto made known, or scarcely suspected. Among several collections of Bats from Carolina and Georgia that have been recently submitted to my inspection, I find two apparently distinct, which are clearly species of *Molossus*, and much related to some of the smaller ones so well illustrated in the work of M. Temminck.

1. *MOLOSSUS CYNOCEPHALUS*.

PLATE III. Fig. 1. the head. fig. 2.

Nycticea cynocephala, LE CONTE in App. to Transl. of Cuv. R. A.

I. p. 442, sp. 3.

Rhinopoma carolinensis, GEOFF.? DESM. Mamm. p. 130?

Description.

Color entirely sooty brown, darker above, paler beneath. Ears with a very short rounded tragus, and remarkable for being singularly and regularly crimped or fluted on their posterior half. Numerous stout bristles about the face. Muzzle broad, and lips thick and pendant, giving the ferocious expression characteristic of the genus. The wings long, and sufficiently ample; the interfemoral membrane naked, and partly sustained by a slender bony process from the hind foot, the tail extending half an inch beyond it. The tibia and fibula short and robust, and included in the membranes their whole

length. Toes nearly equal in length, the two outer rather more robust, and woolly on the outside, and all furnished with fine long hairs springing from the roots of the nails, and forming a fringe on the inner side of the foot. The fur is of a close and velvety texture, unlike the loose and long pelage of the northern *Vespertiliones*.

$$\text{Incisors } \frac{1-1}{6} \quad \text{canines } \frac{1-1}{1-1} \quad \text{molars } \frac{5-5}{5-5} = 32.$$

Total length	- - - - -	3.3 inches.
Tail	- - - - -	1.3 "
Fore arm	- - - - -	1.7 "
Tibia	- - - - -	0.5 "
Spread	- - - - -	10.5 "

I have described this Bat from a specimen furnished to me by Major Le Conte. The first and only notice of the species hitherto published is that given by this gentleman as above quoted, unless it be the doubtful *Rhinopoma carolinensis*, as supposed by my friend Dr. Pickering. There is however no appearance of any nasal appendage whatever, and it exhibits no other affinity with that genus. Major Le Conte obtained it in Georgia, where as he informs me he has observed it in large numbers together. Dr. Bachman has also sent me several specimens, and states that it is common about Charleston, though he had not observed it elsewhere. No other writers appear to have met with it. The curious crimping of the ears is found in another species from Java, the *Dysopes tenuis* of Temm. Monog. I. p. 228, pl. 19, fig. 2. The dentary formula is derived from the MS. notes communicated by Major Le Conte.

2. *MOLOSSUS FULIGINOSUS*.

Plate III. Fig. 3. The head, fig. 4.

Dysopes obscurus, Temm. Monog. I. p. 236, pl. XXII. fig 2. ?*Rhinopoma carolinensis*, Geoff. ? Desm. Mamm. p. 130 ?

Color sooty brown, paler beneath, ears blackish, wings dusky. Ears very broad and ample, occupying the whole side of the head, but not crimped like the preceding. Tragus small, but obvious. Muzzle prominent, face set with long hairs, lips full, but less so than in the former species. Wings long and ample for the genus, with close, scattered, short whitish hairs on the under side. The interfemoral membrane naked, and extending a quarter of an inch further than the wing membranes down the tibia, and terminating in a border, the wing membrane ending abruptly. The tail is robust, extending seven-tenths of an inch beyond the membrane. Outer toes fringed, and all furnished with a few long hairs like the former species. The fur is also similar, much resembling that of a common mole or scalops.

Incisors $\frac{1-1}{4}$ canines $\frac{1-1}{1-1}$ molars $\frac{5-5}{5-5} ? = 30$.

Total length	- - - - -	3.5 inches.
Tail	- - - - -	1.4 "
Fore arm	- - - - -	1.5 "
Tibia	- - - - -	"
Spread	- - - - -	9.6 "

I have seen but a single specimen of this species, which was sent to the Lyceum of Natural History by Dr. Boykin, of Milledgeville, Georgia, where it was procured, and it appears to be altogether unknown to naturalists. With the exception of the legs, from which the bones had been removed and the skin unnaturally stretched, the specimen is in good preserva-

tion, and so prepared that most of the teeth can be examined without injury to it.

The *Dysopes obscurus* of Temminck bears a close resemblance to our species, and may possibly prove to be the same, when better materials for comparison shall be obtained. The description of *Rhinopoma carolinensis* applies equally to this species with the former, and in the number of lower incisors it corresponds still better with it. See Desmarest, *Mamm.*

In order that naturalists may judge with what degree of propriety I have referred these Bats to the genus *Molossus*, and at the same time to complete their description, I shall subjoin the characteristics of that remarkable genus, as laid down by Temminck in his Monography, a work drawn up with great care from materials obtained by the examination of all the principal cabinets of Holland, France, England and Germany.

DYSOPES. Illig. Temm.

Vespertilio, Linn. Gmel. *Molossus*, Geoff. Cuv. Desm.

Nyctinomus, Geoff. Desm. *Cheiromeles*, Horsf. *Dinops*, Savi.

Incisive teeth variable in number with age, $\frac{2}{3}$, $\frac{2}{2}$, $\frac{2}{1}$, or $\frac{2}{3}$, or even $\frac{4}{4}$ in youth. The adult has constantly two upper incisors more or less apart, and converging towards the point. The lower small, bilobed, much crowded, (inferiores 6 conferti, LC.), and all or part of them falling out from the excessive development of the heel (or basal process) of the canine.

Canine teeth $\frac{2}{2}$, the upper large, channeled in front, the lower as it were grafted on an immense heel touching, in the adult, exactly at the base, but spaced in the young, so as to lodge the incisives.

Molar teeth $\frac{4}{4}$; in some species a fifth tooth, or little rudimentary point, scarcely visible, between the canine and the first upper molar (molares superiores 5, anterioribus minutis, LC.)

The total number of teeth very variable with age, so as to

serve to distinguish some species : the maximum is 32 or 34, and the minimum 24 or 26.

M. Temminck observes, that notwithstanding these differences in the teeth, there is no genus of animals, *Felis* and *Pteropus* perhaps excepted, more natural than that of *Dysopes* or *Molossus* in his view of it. He then gives the following natural character as first drawn up by Geoffroy, with some additions of his own.

“ They may be easily recognised by their savage physiognomy and the whole expression of their countenance ; their large head and broad muzzle had caused them to be compared to a bulldog, and designated under the name of *Molossus* ; their head is moreover increased in size by the ears, inclined over, and almost resting upon the eyes, and appearing more fit to protect the organ of sight, than to favor the perception of sound ; they originate very near the commissure of the lips, and after passing behind the auditory opening, they return forwards to unite together on the forehead. The greater part of the *Cheiroptera* have the tragus of the ear placed in the auditory opening, it forms a sort of second inner ear, which then receives the name of auricle ; the *Molossi* differ from them by having this auricle situated forward and outside : it is round and pretty thick : in fine, the species of this genus may be further recognised by their tail, which is long, but with only one half engaged in the interfemoral membrane. Their tongue is soft ; their muzzle not furnished with bristles ; and their nose has none of those membranes or funnel shaped cavities which distinguish the *Vampyres*, the *Phyllostomes*, &c. The nostrils are a little prominent, open in front, and bordered by a raised edging. All the species have the hinder limbs very short, the fibula perfect, often as thick as the tibia, and suited by their divergence to serve for the attachment of the vigorous muscles of their feet ; their toes nearly all equal, with short and very crooked nails ; all have silky hairs on their toes ; the outer or inner toe of the hind feet more or less free from the others,

and in some degree opposable; the thumb of the wing very short, strong and broad; the upper lips ample, with numerous folds, the nostrils placed in a muzzle projecting beyond the lips; but what is still more characteristic, is the apparent insufficiency of the flying membranes, entirely disproportioned to the volume of their large and heavy body; their wings, with narrow and deeply cut membranes, are so disproportioned in some species, that one would say that the animal could scarcely make use of them to transport himself to a distance, and that they merely served as a parachute. Their hind feet are very short, the tibia and fibula well separated for their whole length, and of nearly equal thickness; their muscles are vigorous, the toes armed with hooked nails, and the outer or inner toe free and entirely separated from the others."

This description applies with remarkable exactness to both the *Cheiroptera* now under consideration, and the resemblance becomes still more obvious when we compare them with the excellent plates given by Temminck; where may be found figured several species of similar dimensions, and otherwise closely allied to them, which inhabit Brazil and other parts of South America. From all these they may be readily known, *D. cynocephalus* by its crimped ears, and *D. fuliginosus* by its long legs and long and robust tail. The former differs moreover from all the genus in the short stiff bristles about the face, of which however a few are observed on the *D. cheiropus* of India.

What Temminck remarks relative to the insufficiency of their organs of flight is not applicable to them nor the other smaller American species. The wings are indeed narrow in comparison with the *Vespertiliones*, but long, and no doubt capable of a protracted flight.

I regret that I can furnish no particulars of the habits of these singular animals, but the attention of our naturalists being now turned to the subject, it is to be hoped that the most ample details concerning them will not long be wanting.

On Two Species of PLECOTUS inhabiting the United States Territory. By WILLIAM COOPER.

Read April 3, 1837.

ALTHOUGH the species which afford the type of this genus or group of Cheiroptera, are sufficiently striking in their appearance, and are common in the populous parts of Europe, it was not until the publication of the great work on Egypt that they were first proposed by G. St. Hilaire as distinct from the ordinary *Vespertiliones*. The only ones then known were two European, and one from the island of Timor. They are characterised, besides what is common to them with the other Bats, by the union of the base of the auricular conchs, which are always remarkably ample, and sometimes enormous. Our North American species, as we shall presently find, are further distinguished by two large fleshy appendages in the form of crests, situated between the eyes and nostrils.

Mr. Isidore G. St. Hilaire, published in March 1832, a valuable memoir on this genus, in which he enumerates eight species from various and remote parts of the globe. He subdivides them into those with ears of enormous size, (in some instances as long as the entire body,) and those which are merely ample. In the first he places four species, of which three are found in Europe, one being also common to Egypt, and the fourth brought from the southern hemisphere by Peron. Of those belonging to the second subdivision one is European, one Asiatic, and the two others American, one being from the island of Porto Rico and the other from Brazil. This last is much the largest of the known species, and the *Vespertilio*.

(*Plecotus*) *Maugei* of Porto Rico, is the only one which can be suspected of any specific similarity with those we have here described. But if it be in reality identical with one of ours, the description at present extant must be both too inaccurate and too incomplete to supersede the necessity of a new one.

1. *PLECOTUS LECONTII*.

PLATE III. Fig. 5. the head.

Plecotus macrotis LC. in App. to Mc Murtrie's Cuv. 1. p. 431.

Vespertilio Maugei, DESM. Mamm. p. 145? *IDEM* Nou. Dict?

Plecotus Maugei, Is. GEOFF. Mag. de Zool. 1832?

Longhaired Bat, PENN. Arct. Zool. 1. p. 184. CLAYTON in Phil. Trans.

Description.

Color of the back dusky, terminated with light brown, appearing somewhat variegated if the hairs be disturbed, fur long, soft and close. The remaining upper parts are naked, with the exception of the base of ears behind, and their anterior lower border, which is fringed with fine soft hairs, and a few long fine hairs at the toe joints; the membranous parts of a uniform light brown like the back. The ears are larger than the head, and half as broad as long, the auricle less than half the length of the ears, narrow, sublinear, obtuse, and curving slightly outward. The nose round, set with numerous fine long hairs, and "a very large erect cristiform warty excrescence on each side between the eyes and the nose." The under side of the body clothed with fur, which is very dark dusky at the base with very light gray tips, which predominate over the dusky more and more downward until it becomes between the legs almost a pure white. Tail slightly projecting beyond the membrane.

$$\text{Incisors } \frac{4}{6} \quad \text{canines } \frac{1-1}{1-1} \quad \text{molars } \frac{5-5}{6-6} = 36.$$

Total length	- - - - -	3.4 inches.
Ears, (in the dried sp.)	- - - - -	1.0 "
Tail	- - - - -	1.7 "
Fore arm	- - - - -	1.6 "
Tibia	- - - - -	0.8 "
Spread	- - - - -	10.0 "

The *Vespertilio Maugei* of Desmarest, described from a specimen brought from Porto Rico by Mauge, appears from his description greatly to resemble this above described. The discrepancies, which may be owing to his having only a preserved specimen, are nevertheless too great to allow us to admit their identity without great doubts. Major Le Conte procured it in Georgia, where it appears to be tolerably common, and Dr. Bachman has also sent it to me from Charleston.

Clayton's "Bat with long hair and great ears" appears to be this species.

The name *macrotis* I have ventured to supersede, as being in nowise distinctive of the species, but in reality derived from a generic character, which in some species is still more developed than in the present. The ears being therefore rather *small* for the genus, this name becomes contradictory; and no American naturalist will regret the opportunity thus afforded of paying a well merited tribute to the discoverer of so many rare and remarkable animals of this country.

2. *PLECOTUS TOWNSENDII*.

PLATE 3. Fig. 6, the head.

Description.

Fur on the back dusky at base, brown at the tips, with a ferruginous cast, the two tints appearing nearly uniform, and

not strongly contrasted as in the preceding species. The ears are also fringed with fur in the same manner. Beneath, the fur is of a reddish cinereous or ochreous hue, lighter towards the tail, but not in the least whitish. The nose is similar, but the fleshy crests between the eyes and nostrils appear to be still larger, and in the preserved specimens are much more conspicuous. The ears are similar, though every way more ample in the present, and presenting a different outline immediately after rising from the forehead; the auricle broader and larger. The wing and tail membranes are entirely naked, dusky, of a thicker texture, and much more strongly reticulated than in the first species.

$$\text{Incisors } \frac{4}{4} \quad \text{canines } \frac{1-1}{1-1} \quad \text{molars } \frac{5-5}{4-4} = 36.$$

Total length	- - - - -	3.8 inches.
Ears	- - - - -	1.1 "
Tail	- - - - -	1.7 "
Fore arm	- - - - -	1.8 "
Tibia	- - - - -	0.8 "
Spread	- - - - -	11.0 "

Three specimens of this very distinct new species were brought from the Columbia river by Mr. John K. Townsend, where he procured them on his late journey in company with Mr. Nuttall. It is very like the *P. Le contii*, but they may be readily known by the color of the under part of the body, besides which they differ in almost all their details of color and proportions, the present being a larger and more robust animal. Together they seem to form a small group in the genus, characterized by the double fleshy crest of the nose, which is not mentioned as occurring in any other species.

I regret being obliged to describe these two Bats from dried specimens, in which state the most characteristic marks especially about the head, are often difficult to detect, whatever pains are taken. I have used in describing the head of the

first species, the language of Major Le Conte, from whose notes I have also copied the dental formula.

Vespertilio megalotis, Raf., *Plecotus Rafinesquii*, Lesson, which is described as having the auricle as long as the ears, cannot be either of our species. I am not acquainted with any other species within the United States.

Discovery of the Vauquelinite, a rare ore of Chromium, in the United States. By J. TORREY.

Read April 27, 1835.

About five years ago some specimens of lead ores were presented to me for examination by Professor Moore of Columbia College. They were taken from a mine near the town of Singsing, in the state of New-York, about one mile south of the State Prison. The mine had been wrought for silver nearly as long ago as the period of the American revolution, and has occasionally been opened since that time. In 1827 a company was formed for the purpose of working it, under the impression that it contained a rich vein of silver. In Cleaveland's mineralogy (ed. 2, p. 536) native silver is said (on the authority of Col. Gibb's) to occur at Singsing, in a very small vein. Mr. F. Cozzens obtained a specimen of the native metal in that locality in the year 1825. The company just alluded to, had the old shaft cleared out, and also made, I believe, a horizontal opening communicating with the shaft, from the side of the hill. A few barrels of ore were taken up, and the enterprize abandoned. The specimens that I examined consisted of common galena, associated with copper pyrites, crystallized carbonate of lead, malachite, and an ochery looking substance. The carbonate of lead was mostly in small prismatic crystals which had become blackened throughout, probably by the sulphuretted hydrogen disengaged from the decomposing pyrites, but they still retained their high adamantine lustre. Most of the lumps of ore, contained much of the ochery substance, which I found consisted of clay, oxide

of iron, and oxide of lead. The malachite was seldom in large pieces, but was occasionally well characterized. Mr. F. Cozzens found at the mine some fine specimens of green phosphate of lead.

On carefully examining the specimens given to me by Professor Moore, I observed a green, and a brownish-green substance, in small mammillary concretions, and also in a granular and subpulverulent form. The mammillary portions were from one to four lines in diameter. When broken they exhibited a radiating structure, and a resinous lustre. They were brittle, and yielded a greenish yellow powder. Before the blowpipe this substance grows darker and decipitates, but preserves its green color. With borax it forms a fine green bead. Its powder boiled, with a solution of potassas, is decomposed, and the product yields a golden yellow solution. When acetate of lead is added to this solution, a copious yellow precipitate falls, having exactly the appearance of chrome-yellow. Nitrate of silver produced a crimson precipitate, and nitrate of mercury, a deep red. Some of the yellow alkaline solution, when concentrated by evaporation, yielded crystals agreeing in character with those of chromate of potassa. A few grains of the powdered mineral were mixed with fused chloride of sodium and placed in a tube-retort; on the addition of concentrated sulphuric acid, dense red vapours of peroxide of chromium were disengaged, part of which condensed into a liquid, resembling in all respects the liquid called chloro-chromic acid, by Dr. Thomson. The existence of chromic acid being now rendered certain, it only remained to determine the base or bases. A very few experiments showed that the acid was in combination with oxide of lead, and oxide of copper. Hence the mineral is a chromate of lead and copper, and is identical with the Vauquelinite of Berzelius, the cupreous chromate of lead of Cleaveland, and *plomb chromé* of Brongniart, (his *plomb chromaté* being the red chromate of lead.) The mineral was first examined by Vauquelin, and noticed by him in

his analysis of the *red lead ore of Siberia*,* (the ore in which chromium was discovered by that celebrated chemist); but he does not appear to have regarded it as a distinct species. Cleaveland places it as a *sub-species*, after the chromate of lead. It was first, I believe, raised to the rank of a species by Leonard, and adopted by Berzelius, who notices it in his essay on the blowpipe, under the name of Vauquelinite. Most of the modern writers on mineralogy, consider it as distinct, both in chemical and physical characters from the red ore of chrome.† In the system of Mohs, Vauquelinite is still placed in the appendix which contains the *proposed species*, or such as are not yet fully established. It must occupy this place in any system based on physical characters alone, until its crystalline form can be clearly determined; and unfortunately it has hitherto only been found, either massive, or in crystals so microscopic, that they cannot be submitted to the goniometer.‡

The Vauquelinite is one of the rarest minerals known. Notwithstanding it is nearly forty years since it was discovered, there is but one undoubted locality of it recorded: this is the

* This mineral is not a dichromate as stated by Turner, (ed. 5. p. 570.) but a compound identical with the ordinary artificial chrome yellow. It is only red in a crystalline state, and becomes *yellow* when reduced to powder, like the *red chromate* of potassa, and some other red crystalline matters. When it was more abundant it was used as a *yellow*, not as a *red* pigment. There is, however, frequently occurring with the *red lead ore*, a distinct species, lately determined by Hermann, and called by him Melanochroite. It is crystallized, and its powder is of a red colour. Dr. Thomson (*Outlines of Mineralogy*, &c. 1. p. 561) regards it as a *Subsesquichromate of Lead*.

† Dr. Thomson (l. c. p. 576) says that the Vauquelinite is a compound of two atoms of chromate of lead, and one atom of oxide of copper; but Berzelius (*Traité*, 4. p. 355) calls it *chromate plumbico-cuivrique sesquibasique*, and his view of its composition is probably correct. The results obtained by the analysis of Berzelius were

Chromic acid	- - -	28.33.
Potoxide of Lead	- - -	60.87.
Oxide of Copper	- - -	10.80.

‡ Perhaps even these minute crystals are merely phosphate of lead. See *Phillip's Mineralogy*, p. 350.

gold mine of Berezof, near Catharineberg in Siberia, where it accompanies the red lead ore. The green mineral found with the red chromate near Cocæs in Brazil, may be the Vauquelinite.

My motive for so long postponing an announcement of the discovery of this mineral in the United States, was merely a wish to make, first, a careful analysis of it; but I have been unable to do this, from the difficulty of obtaining a sufficient quantity of it for my experiments. After the mine was found not to be productive, the shaft was allowed to fall into ruin, and to become full of water, so that it is impossible to open the mine again without incurring considerable expense. I visited the place last year, for the purpose of exploring among the rubbish about the mouth of the mine, but I found only a few very poor specimens of the ore. A quantity of it was brought to this city some years since, but I have not been able to ascertain what became of it. As it may be several years before a new supply of the mineral can be obtained, I am induced to offer this imperfect notice to the Lyceum, hoping that it may induce some of our zealous mineralogists to visit the locality and clear out the shaft. I ought to state in conclusion, that I have examined the splendid suite of Berezof specimens in the valuable cabinet of our associate Mr. Cramer, and I found his specimens of Vauquelinite to agree in every respect with the Singing mineral.

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*An Account of several new Genera and Species of NORTH
AMERICAN PLANTS. By J. TORREY.*

MACRANTHERA LECONTII, Plate 4.

Segments of the calyx entire, linear-lanceolate, scarcely one-third the length of the corolla.

Root perennial. *Stem* herbaceous, from two to three feet high, simple, somewhat pubescent, obtusely quadrangular. *Leaves* nearly smooth on both sides; lower ones ovate-lanceolate, opposite, petiolate, pinnatifidly lobed, with the segments entire or toothed; the upper ones oval, coarsely toothed; those at the base of the peduncles quite entire. *Flowers*, in a terminal raceme, erect. *Peduncles* about an inch long, declined at the base, and curved upward towards the summit. *Calyx* subcampanulate, deeply cleft; segments nearly equal, linear-lanceolate, from one-fourth to one-third the length of the corolla, acute. *Corolla* deep yellow, an inch long and 2—3 lines in diameter, somewhat cylindrical and incurved, of a thick and pretty firm texture; border 5-toothed; the segments ovate-oblong, spreading. *Stamens* nearly equal, at first included, but at length much exerted, scarcely declined; *filaments* woolly, rather thick; *anthers* about 3 lines long, linear, sagittate at the base, somewhat cohering, woolly. *Ovary* ovate, acute, 2-celled, many-seeded. *Style* very long and slender. *Stigma* simple, very minute. *Capsule* short, ovate, acuminate.

HAB. In dry pine woods on the Alatomaha, in Liberty County, Georgia. *Major Le Conte!* In bogs, Middle Florida, *Dr. Chapman!* Flowers in September.

OBS. This plant was discovered about seven years ago by Major Le Conte, from whom I received specimens marked, "A new genus, allied to *Gerardia*." I proposed for it the name *Macranthera*, but refrained from publishing it, in the expectation that the discoverer himself would describe it, which however, he declined doing, kindly permitting me the favour of making known to botanists this interesting addition to our Flora.

A second species of the genus was shortly after received in a collection of plants gathered by Dr. Gates in Alabama, specimens of which were distributed by me under the generic name of *Macranthera*; but before I was prepared to publish my account of the new genus, it was described by Mr. Nuttall in the *Journal of the Academy of Philadelphia*,* under the name of *Conradia fuschoides*, that learned botanist not being aware that a genus belonging to the order Gesneriaceæ,† had already been called *Conradia* by Martius, and hence Mr. Bentham, in his revision of the genera of Scrophularineæ,‡ has adopted my name, which he found in Dr. Lindley's herbarium, but, by mistake, quotes it as Mr. Nuttall's. In the recent Synopsis of the Gerardiæ, published in the Companion to the Botanical Magazine, edited by Sir W. J. Hooker, this error is corrected.

Macranthera belongs to the tribe Gerardiæ of Bentham, in the order Scrophularineæ, and differs from *Gerardia* in its deeply parted calyx, tubular corolla with a small spreading border, and in the much exserted stamens. In the elongated stamens it resembles *Esterhazyia*,|| but in that genus the calyx is only 5-toothed, and the corolla tubular-campanulate: the habit also is very different. Like nearly all the plants of the tribe Gerardiæ, both species of *Macranthera* turn black in drying. Mr. Bentham was only acquainted with *M. fuschoides*, in which the segments of the calyx are longer than the tube of the corolla, a character which he has introduced into his definition of the genus; but in *M. Lecontei* the calyx is scarcely one-third the length of the corolla; so that the generic character must be somewhat modified.

* Vol. vii. p. 98, t. ii. and xii.

† *Nova gen. et. sp. &c.*, a work which had not reached this country at the date of Mr. Nuttall's publication.

‡ Published in the Botanical Register for June, 1835.

|| *Esterhazyia* of Mikan., and Benth. in Hook. comp. bot. mag. p. 203; *Virgularia*, Martius Nov. gen. et. sp. 3, p. . . .; *Gerardia* & *Dargeria*, Cham. and Schlecht. (not of Benth.)

www.libto **AMPHIANTHUS.**

CALYX 5-parted, and unequal. **COROLLA** tubular-infundibuliform; limb somewhat bilabiate, 4-lobed; inferior lobe somewhat larger. **STAMENS** 2, superior, included; inferior ones wanting. **STYLE** simple; stigma minutely bifid. **CAPSULE** obcordate, compressed, 2-valved, opening at the summit; valves entire. **SEEDS** numerous, naked, anatropous.—Herbaceous, minute, annual, throwing up filiform scapes; radical leaves linear, sessile; flowers solitary, both radical, and at the summit of the scapes.—*Nat. Ord.* SCROPHULARINEÆ.

AMPHIANTHUS FUSILLUS.

Root annual; fibrous, the fibres compressed, linear. *Stem* very short, compressed, bearing a tuft of oblong-linear leaves at its summit. *Leaves* about 2 lines long, rather obtuse, entire, veinless, somewhat succulent. *Scapes* filiform and very slender, and 1—1½ inch in length, compressed, bearing a single pair of opposite oval bracts at the top. *Bracts* nearly sessile, obtuse, somewhat succulent, obscurely 3-nerved. *Flowers* very minute; radical ones 2—3 on each plant, attached to short recurved peduncles, which originate from the tuft of leaves; terminal ones solitary, nearly sessile between the bractæ (i. e. without any proper pedicel). *Calyx* 5-parted; the divisions oblong, erect, very obtuse, dotted with a number of minute glands. *Corolla* scarcely a line in length, white, straight, tapering downward; limb somewhat dilated, slightly bilabiate, 4-lobed; the lobes erect, rounded, and somewhat emarginate; the inferior one larger. *Stamens* constantly 2, superior, scarcely half as long as the corolla; filaments slender, adnate the lower two-thirds of their length, smooth; cells of the *anthers* approximated, subglobose. *Ovary* ovate, acute, compressed, surrounded at the base with a minute red disk, 2-celled, many-seeded; *style* rather larger than the ovary, subulate; *stigma* minute, bifid at the summit. *Capsule* broadly obcordate, compressed, opening along the edge at the summit; valves entire, convex; dissepiment adhering to the valves. *Seeds* 10—15 in each cell, linear-oblong, fuscous, straight; *embryo* straight; *cotyledons* oblong, distinct; *radicle* oblong.

HAB.—In small excavations on flat rocks, where the soil is wet during the flowering season; Newton County, Georgia. Flowers in March and April. *Dr. M. C. Leavenworth!*

Obs.—Specimens of this minute plant were sent to me in the autumn of 1836, by the discoverer, and also by Dr. Boykin, of Milledgeville, Georgia, who received them from Dr. Leavenworth. It has hitherto been found only in one spot, where it occupies a space of four or five feet in diameter, to the exclusion of almost all other plants. It resembles, at first sight, a *Callitriche*; and when overflowed, the slender scapes, doubtless become natant. The plant belongs to the order *Scrophularinæ*, and is nearly allied to *Veronica*. Its characters and habit are, however, so peculiar, that there can be little doubt of its constituting a new genus. From *Veronica* it differs in its tubular-infundibuliform, 5-lobed, and somewhat bilabiate corolla. The most remarkable character of the plant, is its two-fold inflorescence; part of the flowers being produced near the root, on short naked pedicels which originate among the radical leaves, while others are supported on long capillary bibracteate scapes. The flowers in both situations are perfect; not like those of *Amphicarpæa*, some species of *Polygala*, and many *Violæ*, of which those produced near the root are incomplete. In *Milium amphicarpon* Pursh, (of which Kunth has made a distinct genus) the subterranean flowers, as in the *Amphianthus*, are perfect, like those of the panicle.

In describing the seeds I have used the term anatropous in the sense in which it is employed by Mirbel, and as explained by Dr. Gray in his excellent *Elements of Botany*.

EMPETRUM CONRADII.

Branches smooth; leaves subverticillate and alternate, narrow-linear, when young glandularly hispidulous, in the adult state smooth; flowers aggregated in small capituli, terminal and axillary; scales of the perianth 5—6, obovate-oblong, smoothish; stamens 3—4; style 3—4-parted; ovary 3—4-celled.

Semipervirent, procumbent, and much branched, spreading in a circular manner; the branches subverticillate and fasciculate, ascending at the extremity, invested with a loose gray cuticle, which separates and exposes a reddish bark. *Leaves* coriaceous, about five lines long, and scarcely half an inch in breadth, slightly pointed at the tip, crowded, particularly towards the summit of the branches, mostly somewhat verticillate, but often opposite, and sometimes alternate; the upper surface bright green, under a lens, (particularly in the young leaves) appearing covered with minute short glandular hairs, when old nearly smooth; the true margin remarkably revolute; the edges nearly meeting on the under side; apparent margin minutely denticulate; petiole very short but distinct, articulated to the branches. **MALE FLOWERS** sessile in the axils of the leaves at the summit of the last year's branches. *Perianth* composed of 5 or 6 oblong, or obovate-oblong, smoothish scales, the inner ones scarcely petaloid, forming an oval bud, from the apex of which the stamens protrude. *Stamens* mostly 3, sometimes 4; *filaments* 2 lines long, slender, smooth, inserted into a minute receptacle; *anthers* roundish, two-celled, opening longitudinally on the outside, no rudiment of an ovary.—**FERTILE FLOWERS** inconspicuous, collected in very small heads at the summit of the branches. Each head composed of 10 to 12 flowers, surrounded with a number of short brownish concave bracts. Scales of the perianth about 5, obovate, obtuse; the inner ones smaller, tinged rose-color, nearly smooth. Ovary obovate, 3—4-celled; each cell containing a single ovule; style three times as long as the ovary, purplish red, cleft below the middle; the divisions somewhat spreading.

HAB.—Sandy fields in pine barrens near Cedar Bridge, Monmouth County, New Jersey! Also near Pemberton Mills, about ten miles from Burlington, in the same state, *S. W. Conrad, Esq.*!

Obs.—This very interesting addition to the botany of the United States, was first discovered by the late Solomon W. Conrad, Esq. Professor of Botany in the University of Pennsylvania, a short time before his death, but the infirm state of his health did not permit him to examine the plant. My friend Dr. Pickering, of Philadelphia, supplied me with some of Mr. Conrad's specimens, on which were a few male flowers, and afterwards the same plant without fructification, was

communicated to me by Mr. Rafinesque. A careful examination of the scanty materials placed in my hands, soon convinced me that this little evergreen belonged to the order EMPETREÆ of Nuttall, and that it was a new species of *Empetrum* itself, or possibly of *Ceratiola*; but the want of more perfect specimens, and especially of the fertile flowers, prevented my determining the genus with certainty until the present spring. About two years ago I made a visit to the locality at Cedar Bridge, pointed out to me by Mr. Rafinesque, for the purpose of obtaining the fruit. A large patch of it was found about one hundred yards south of the western tavern, near the roadside, and, on further search, a considerable quantity was discovered about four hundred yards south-east of the same tavern, in an open sandy space; but I was unsuccessful in my search for the fructification. It is a true evergreen, growing prostrate in the pure white sand of that singular region, and forming dense circular mats, a yard or two in diameter. The following year I procured a supply of the living plants, which, under the care of my friend A. J. Downing, Esq. of Newburgh, have lately produced abundance of pistillate blossoms, but, for want of the staminate flowers, they will prove abortive. The genus *Empetrum* belongs to the small natural order Empetreae, which was first indicated by Mr. Nuttall in his *Genera of North American Plants*, (published in 1818) and characterized more fully by Mr. D. Don in the *Edinburgh New Philosophical Magazine* (1826). Hooker, in the *Botanical Magazine*, (fol. 2758) has made some valuable remarks on the order, under the genus *Ceratiola* of Michaux. The only genera referred to it are *Empetrum*, *Corema*, and *Ceratiola*, the whole including but five species, which are confined to Europe and Extratropical America. Bartling (*Ord. Nat.* p. 372) appears to have drawn the character of the order from *Empetrum nigrum*, since it accords very well with that plant, but does not agree in every respect with *Ceratiola*; for he states the number of the stamens to be three; and both this author and

Dr. Lindley describe the fruit as from 3 to 9-celled, whereas *Ceratiola* has but two stamens, and a 2-celled, 2-seeded berry. In that genus, however, the ovary is perhaps many-celled in its young state, or rather is composed of many carpels, all of which are abortive except two, for the short style is divided into numerous stigmas, the number of which probably corresponds with that of the cells or carpels. In *Corema* the fruit is 3-celled.

Jussieu referred to *Ericææ* the only genus of this order known to him, but without being satisfied with its station. Nuttall correctly remarks that *Empetreaæ* resemble *Ericææ* only in their leaves, though I cannot agree with my learned friend in regarding them as closely allied to *Coniferaæ*. Mr. Don, (with whom Lindley seems now to agree) thinks the order holds an intermediate place between *Euphorbiaceæ* and *Celastrineæ*.

The new species here described has a strong resemblance to the *E. album* a native of Portugal, which D. Don, on account of its 3-celled fruit, has separated from the other species of the genus, under the name of *Corema*.* It has much the habit of *E. rubrum*, Willd.† a native of the southern extremity of South America. It differs, however, in its much narrower leaves, which are not woolly on the margin, but merely fringed with short glandular hairs, and in its nearly smooth branches. The scales of the flower also are fewer in number, and of uniform texture and appearance.

All the individuals of this species that I saw at Cedar Bridge were probably pistillate, but I could discover none of the fruit, either on the plants or in the sand about them. It may seem remarkable that an evergreen shrub should so long have escaped detection, in a region which has been so much explored by botanists as the sandy district of New Jersey; but many of the plants of those pine barrens are extremely local, and there are still large tracts of the country south of Toms

* *Edinb. New Phil. Mag.* l. c.

† A very good figure of this species is given in the *Botanical Register* for August 1836, t. 1783.

River, that have not yet been examined. Indeed, almost every year some additions are made to the Flora of New Jersey, by the discovery of new and rare plants, chiefly from Monmouth, Gloucester, and Burlington counties. It is not improbable that in some of the unexplored parts of the pine barrens other localities of our *Empetrum* will be found, with the ripe fruit, which is still a desideratum in its history.

In an abstract of the botanical discoveries of De la Pylaie in Newfoundland, published in the Transactions of the Linnæan Society of Paris, this zealous botanist (who never lived to complete his Flora of that large island) enumerates the *Empetrum rubrum*. Can this be identical with the South American species, or is it our *E. Conradii*? The *Schizæa pusilla* of Pursh affords a remarkable example of a plant growing in two places widely separated in latitude, and only in one intermediate spot. Gaudichaud found it in the Falkland Islands, and De la Pylaie in Newfoundland, while between these two points it has only been detected in the pine-barrens of New-Jersey.*

LEAVENWORTHIA.†

CALYX somewhat erect, equal at the base. PETALS equal, cuneiform, truncate or emarginate. FILAMENTS distinct, toothless. SILIQUE sessile, oblong-linear, compressed, somewhat inflated and torulose; valves indistinctly nerved. STYLE distinct, or almost wanting. STIGMA minutely bidentate. SEEDS in a single series, flattened, with a broad winged margin. FUNICULUS free.‡ EMBRYO nearly straight, or with the radicle

* See Ann. Lyc. vol. iii. p. 266.

† In honor of Dr. M. C. Leavenworth, of the United States army, an indefatigable botanist, who has largely contributed to our knowledge of the plants of Arkansas, Louisiana, and Florida.

‡ Adhesion of the funiculus to the septum is not a frequent character in Cruciferae. De Candolle remarks, that it occurs only in *Petrocallis* and *Lunaria*. It has since been noticed in *Pterolobium*, Andrz. and *Coringia*, Heist.

somewhat bent on the cotyledons: the radicle very short, conical, pointing obliquely upwards towards the hilum. **COTYLEDONS** orbicular. **DISSEPIMENT** 1-nerved, minutely reticulated; the areolæ transversely linear-oblong.—Herbaceous, annual; leaves lyrate pinnatifid; flowers on long subradical peduncles, or in loose racemes, yellow.—*Nat. Ord.* **CRUCIFERÆ.**

LEAVENWORTHIA AUREA, Plate 5.

Style distinct; embryo nearly straight.

Root straight, simple, descending. *Plant* 2—6 inches high. *Stem* at first short and simple, but at length branching from the base; the branches assurgent, smooth. *Leaves* mostly radical, about 2 inches long, (including the petioles) pinnatifid; rather thick; segments 2—4 parts, roundish-oblong, with a few obtuse teeth; terminal one much the largest, somewhat orbicular. *Racemes* 4—10-flowered. *Flowers* in the young plant, solitary, on long erect naked peduncles; in advanced specimens racemose on the short assurgent branches. *Pedicels* without bracts, an inch or more in length, filiform, spreading and curved upward. *Calyx* imbricate in æstivation*, rather loose; sepals oblong, obtuse, tinged with purple. *Petals* yellow, tapering to a long cuneate base; the limb truncate and somewhat emarginate. *Stamens* distinct; filaments slender; *anthers* oblong. *Ovary* sessile, oblong; style short but distinct, straight; *stigma* minute, somewhat 2-toothed. *Siliqua* rather more than an inch long, and nearly 2 lines in breadth, slightly torulose, rather convex, obscurely nerved. *Dissepiment* very thin and transparent, separable into two lamina, with a waved central line, or raphe, running from the summit to the base; under a strong lens exhibiting anastomosing veins or tubes, the interstices of which are more or less linear, and transverse, or at right angles to the longitudinal nerve.† *Seeds*

* A valvate æstivation of the sepals is very rare in Cruciferæ. It was first noticed by R. Brown (*Obs. on Plants collected by Oudney, &c.* p. 7.) in Savignia and Ricotia, and Meyer has since detected it in Coringia, *Heist. (pl. of Caucasus, p. 191.)*

† R. Brown, who first introduced the structure of the dissepiment into characters of the genera of Cruciferæ, says, he expects with much confidence that it will present great uniformity in strictly natural genera. He states, that "in many cases, though certainly not in all, he found a resemblance in this respect in more extensive groups." I have examined many Cruciferæ, chiefly North Ame-

usually 5, much compressed, suspended on short rigid funiculi, approximated so that their broad membranaceous margins somewhat overlap. Embryo nearly straight from the earliest to the most mature state. The radicle points upward, at first inclined a little from the hilum, but gradually approximating towards it. Cotyledons plano-convex.

HAB.—Wet places on the priaries in the vicinity of Fort Towson, Arkansas; also in Texas, and in Jefferson County, Alabama; *Dr. M. C. Leavenworth!*

LEAVENWORTHIA MICHAUXII.

Style almost wanting; radicle oblique.

Cardamine uniflora, Michx! *fl. Bor. Amer.* 2, p. 29; *Pursh, fl.* 2, p. 439, *D. C.!* *system.* 2, p. 251.

HAB.—On rocks about Knoxville, Tennessee, *Michaux!* v. s. in herb. Mus. Paris. On wet rocks, Kentucky; very rare, *Dr. Short!*

OBS.—This species is extremely like *L. aurea*, but appears to be distinct. In habit, and in the form and size of

rican species, without, however, finding this character at all uniform. In *Sisymbrium Sophia* and *S. sophioides*, the dissepiment is marked with two very strong nerves, extending from the base to the apex, and the tubuli are reticulated; the areolæ oblong and longitudinal. In *S. obtusangulum* and *S. Columnæ* the tubuli form distinct waved descending lines. In *S. officinale* the dissepiment is opaque and nerveless; the tubuli very minute, indistinct and descending. In *S. canescens*, Nutt. (which seems to be identical with *Erysimum pinnatum*, Walt. *Cardamine Menziesii*, D. C. and *S. brachycarpum*, Richards.) the tubuli are irregular, but a large proportion of the areolæ are linear and transverse, and the dissepiment is 1-nerved. The funiculi are also adnate. *Sisymbrium Thaliana* has no midnerve to the dissepiment, and the tubuli are reticulated, forming oblong longitudinal areolæ.

The tubuli in *Arabis ambigua*, D. C. and *A. pendula*, Linn. are descending, forming tortuous parallel lines; but in *A. Turrita* they are irregularly reticulated, and the areola amorphous. In *A. Canadensis* they are exceedingly contorted and irregularly reticulated. Notwithstanding this variety in the structure of the dissepiment, it is very constant in the same species, and the characters derived from it are doubtless often of generic importance.

the leaves and flowers, the resemblance is striking. The style, however, is very evident in the latter, but is almost wanting in *L. Michauxii*. The difference in the direction of the radicle seems also to be constant. From the appearance of the dried specimens, I am of opinion that the flowers in the second species are pale yellow. Michaux states that the peduncles are solitary and one-flowered; but I observed his specimens to be caulescent, the short assurgent stems bearing elongated one-flowered peduncles, as in the southern species.

For my first knowledge of the *L. aurea* I am indebted to my friend Dr. Short of Kentucky, who shared with me the specimens he received from Dr. Leavenworth, its discoverer. Subsequently I received some excellent specimens from Dr. L. himself. Its general appearance is that of a *Cardamine*, and I supposed it might be a species of that genus, but on examining the seed I was surprised to find the embryo almost perfectly straight, so that the plant could not be referred to either of De Candolle's great suborders of *Cruciferae*, the cotyledons being *accumbent* in *PLEURORHIZÆ*, and *incumbent* in *NOTORHIZÆ*. Indeed it is the only species belonging to this family, with which I am acquainted, in which the embryo (except in the earliest state) is straight.*

After I had completed my description of this plant, I received from Dr. Short a good specimen of *Cardamine uniflora*, a species which I had seen in Michaux's herbarium, and which I was very desirous of examining again, and comparing with the *Leavenworthia*. It proved to be a second species of the genus, readily distinguishable by the almost entire absence of the style.

Respecting the value of characters derived from the embryo as the basis of classification in this large order, some of the most distinguished modern botanists differ in opinion. Schkuhr and Gærtner were well acquainted with the principal diversities of structure which the embryo in *Cruciferae* exhibits.

* As in the *Rectembriae* among *Leguminosæ*.

With the latter botanist originated the terms *accumbent* and *incumbent* now so generally employed, although neither he nor Schkuhr used these characters in classifying the Cruciferae. The form and direction of the Cotyledons were first introduced into the generic characters by R. Brown, in the second edition of the *Hortus Kewensis*, (vol. iv. 1812) but not extensively, as this was not a suitable work in which to develop his views. De Candolle, in his *Systema* (1821), and in his *Mémoire sur les Crucifères* (1821), as well as in his *Prodromus*, (vol. i. 1824), adopted Brown's idea of the importance of the embryo in this family, and made it the basis of his classification, but carried it further, perhaps, than the great English botanist intended. It must be confessed that there are a few instances in which the modifications of the embryo are not even of generic importance, as in *Hutchinsia alpina* and *petraea*, noticed by Brown, the cotyledons being accumbent in one species and incumbent in the other. In *Lepidium Virginicum*, as shown in Schkuhr's figure, (*Handb.** 2, t. 180,) and in Hooker's *Flora Boreali-Americana*, the cotyledons are accumbent, while in the rest of the genus they are incumbent. *Capsella Bursa pastoris*, which has incumbent cotyledons, is now generally admitted to be distinct from *Thlaspi*. In *Cakile*, as the genus is limited by De Candolle, there are species in which the cotyledons are not accumbent. In the figure of *C. æqualis*, as given by Delessert in his *Icones Selectæ*,† (the drawings of which were executed by Turpin,) the cotyledons are represented as *incumbent*, a circumstance which appears to have escaped the notice of De Candolle, although he quotes the figure in his *Prodromus*.‡ In *C. maritima*, C. A. Meyer§ states that he found the seed in the lower cell of the silique, having the radicle oblique or tangent to the limb of the cotyledon, while in the upper cell

* There called *L. Iberis*, but not the plant of Linnæus thus named.

† 2, t. 57.

‡ 1, p. 186.

§ *Enum. pl. Cauc.* p. 186. (1831)

the cotyledons were incumbent. I have carefully examined our common species of this genus, which is generally regarded as hardly a variety of *C. maritima*, but I find the cotyledons constantly accumbent. Once, indeed, I saw the lower seed with incumbent cotyledons, while in the upper they were in the ordinary state. In another instance they were incumbent in the inferior seed, and spirally twisted on the axis of the silicle in the inferior. In our common *Arabis lyrata** the cotyledons are obliquely incumbent, the radicle lying close by the edge.

De Candolle states in his *Mém. sur les Crucif.*, that of 970 species of this family, described in his *Systema*, he had dissected the fruits and seeds of more than 700, and yet he noticed scarcely any anomalies. He, however, overlooked the incumbent cotyledons of *Arabis Thaliana*, Linn., which Sir W. Hooker, following Gay,† has very properly removed to *Sisymbrium*, as the radicle is truly dorsal.

Some valuable observations on the embryo of *Cruciferae*, by MM. Monard and Gay, are recorded in the seventh volume of the *Annales des Sciences Naturelles*.‡ They give an account of seventeen species which deviate from the character of the suborder to which they were referred in the *Systema*. Some of these were corrected by De Candolle himself in the *Prodrômus*, while others were merely placed in wrong genera. About half the plants noticed by these botanists are examples of accumbent and incumbent species existing in the same genus. Dr. Brown (in *Pl. of Oudney*, p. 6,) thinks that in dividing *Cruciferae* into natural sections, we are not to expect absolute uniformity in the state of the cotyledons; at least in the accumbent and flatly incumbent states. This learned botanist does not, however, inform us to what extent he is at present disposed

* The tubuli of the dissepiment in this species are like those of *A. Canadensis*,
† *Ann. Sc. Nat.* 7, p. 399.

‡ Observations sur quelques Crucifères décretes par M. De Candolle dans le second volume de son *Syst. Nat. Reg. Veg.*—Par I. P. Monard, avec des notes de M. Gay. *Ann. des Sc. Nat.* 7, pp. 389–419, (1826.)

to employ characters derived from Cotyledons, in subdividing this great natural family.

I have remarked that the genus *Leavenworthia* can hardly be referred, with certainty, to either of De Candolle's grand divisions of the Cruciferae. In the mature seed the radicle is only about one-fourth the length of the cotyledons, very slightly curved, or bent a little to one side, thus showing a tendency to become accumbent. This is its form at the earliest appearance of the embryo.* It is always directed upward (or towards the style, as the seed lies in the pod); at first turned a little *from* the umbilicus towards the opposite side of the replum, but gradually becoming erect, or even inclining towards the hilum, as the seed becomes more completely campulitropous.

It remains for me to notice the affinities of this new genus. Disregarding the peculiarity of the embryo, the only tribe of PLEURORHIZÆ, with which it can be compared, is *Arabideæ*; and among NOTORHIZÆ, it has but little resemblance to any, except to a small section (*Arabidopsis*) of the genus *Sisymbrium*, all of which have white flowers.

In the form of the silique, and in the margined seeds, it approaches some species of *Arabis*; but the valves are not nerved, and the flowers are yellow. Its resemblance to the species of *Cardamine* with pinnated leaves, particularly to *C. Ludoviciana*, (which deviates from the character of the genus in its

* The embryo of Cruciferae, when first visible, is always straight, lying with its radicle pointing to the foramen on one side of the campulitropous seed; viz. that which would be the superior portion of it were the seed straight, with the cotyledons directed to the curved part, or *apparent* summit. As the embryo grows, it curves round, so that the cotyledons fold upon the radicle, and are thus directed to the hilum, which, in seeds of this kind, is always next the foramen. The gradual curvature of the embryo in Cruciferae is clearly exhibited in plate 42, fig. 3 of Brongniart's admirable *Mémoire sur la Génération et le Développement de l'Embryon dans les Veg. Phan.* Ann. des Sc. Nat. tom. 12. I have observed the same changes in *Arabis Turrita* and *A. ambigua*.

† *C. glauca* Spreng. (Deless. ic. 2, t. 31.) also has margined seeds.

broad silique, margined, and even winged seedst) is considerable, but it differs widely in the shape and color of the petals, the structure of the dissepiment, and in many other respects. In the broad silique and dissepiment (compared with any of the Arabideæ) it seems allied to some Alyssineæ, especially if we retain in that tribe the remarkable *Selenia* of Nuttall, which resembles our plant in the transverse areolæ of the dissepiment, pinnatifid leaves, and yellow flowers. In that genus, however, the fruit is broader, the style longer, and the seeds are truly accumbent, although the radicle is unusually short, and is directed horizontally with respect to the axis of the fruit. Upon the whole I consider it more nearly related to *Selenia* than to any other known genus.

Description of the Plate of Leavenworthia.

- Fig. 1. A young plant of *L. aurea*, of the natural size.
2. A full grown plant of the same.
3. A flower magnified.
4. A petal do.
5. The silique laid open to show the arrangement of the seeds.
6. The replum and dissepiment, exhibiting the longitudinal nerve, and the funiculi.
7. The embryo.
8. A transverse section of the same.
9. Pistil of *L. Michauxii*.
10. Silique of the same.
11. Embryo.

Fig. 1

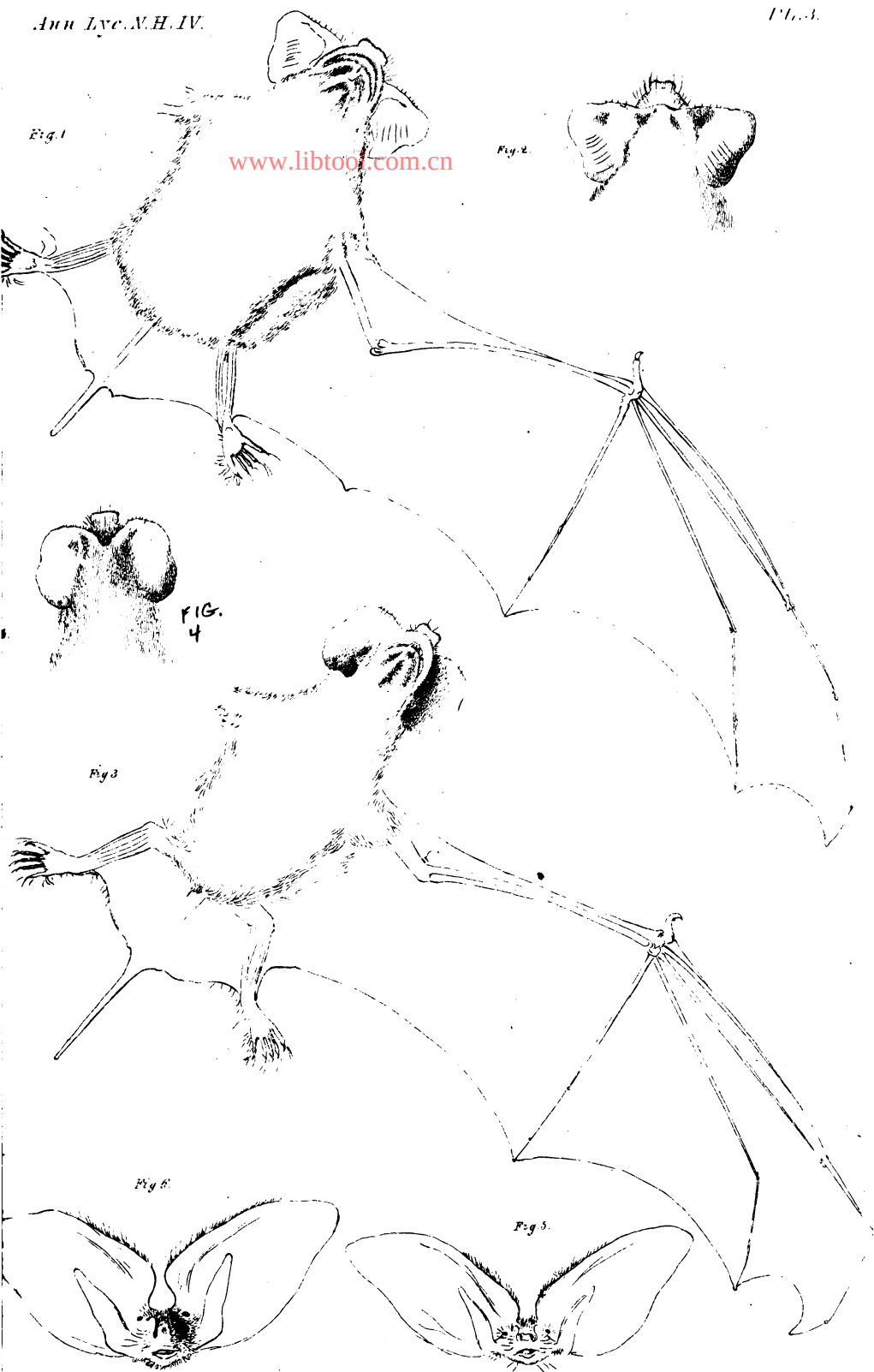


Fig. 2



FIG. 4

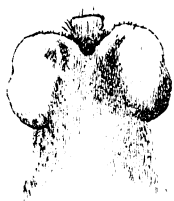


Fig 3

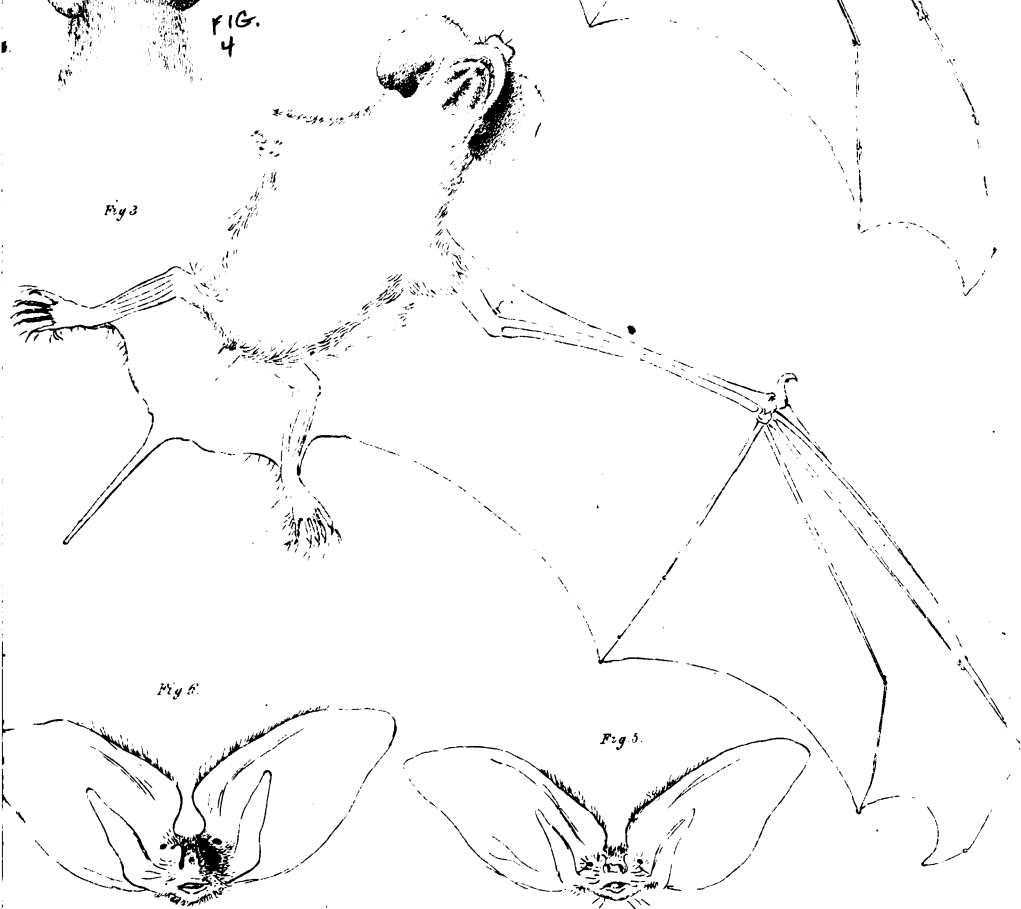
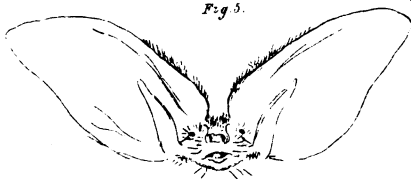


Fig 6.

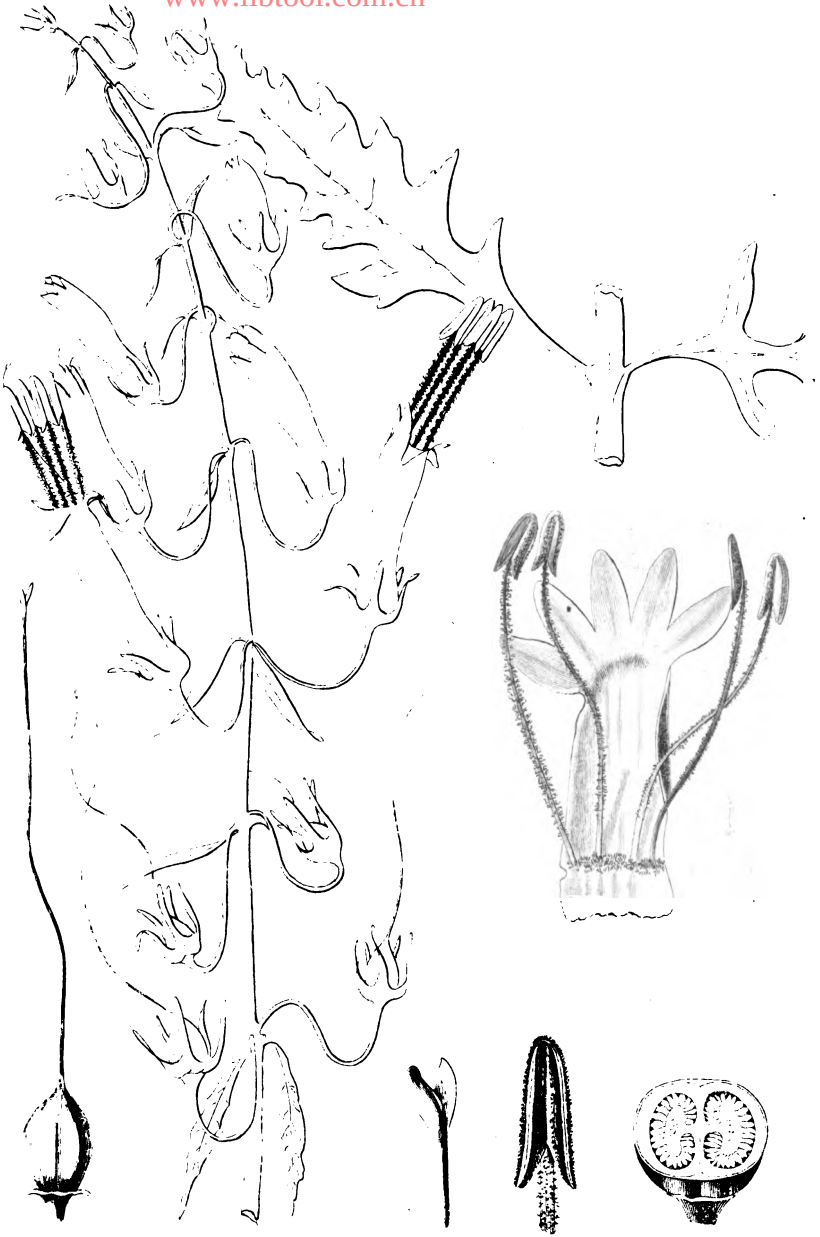


Fig 5.



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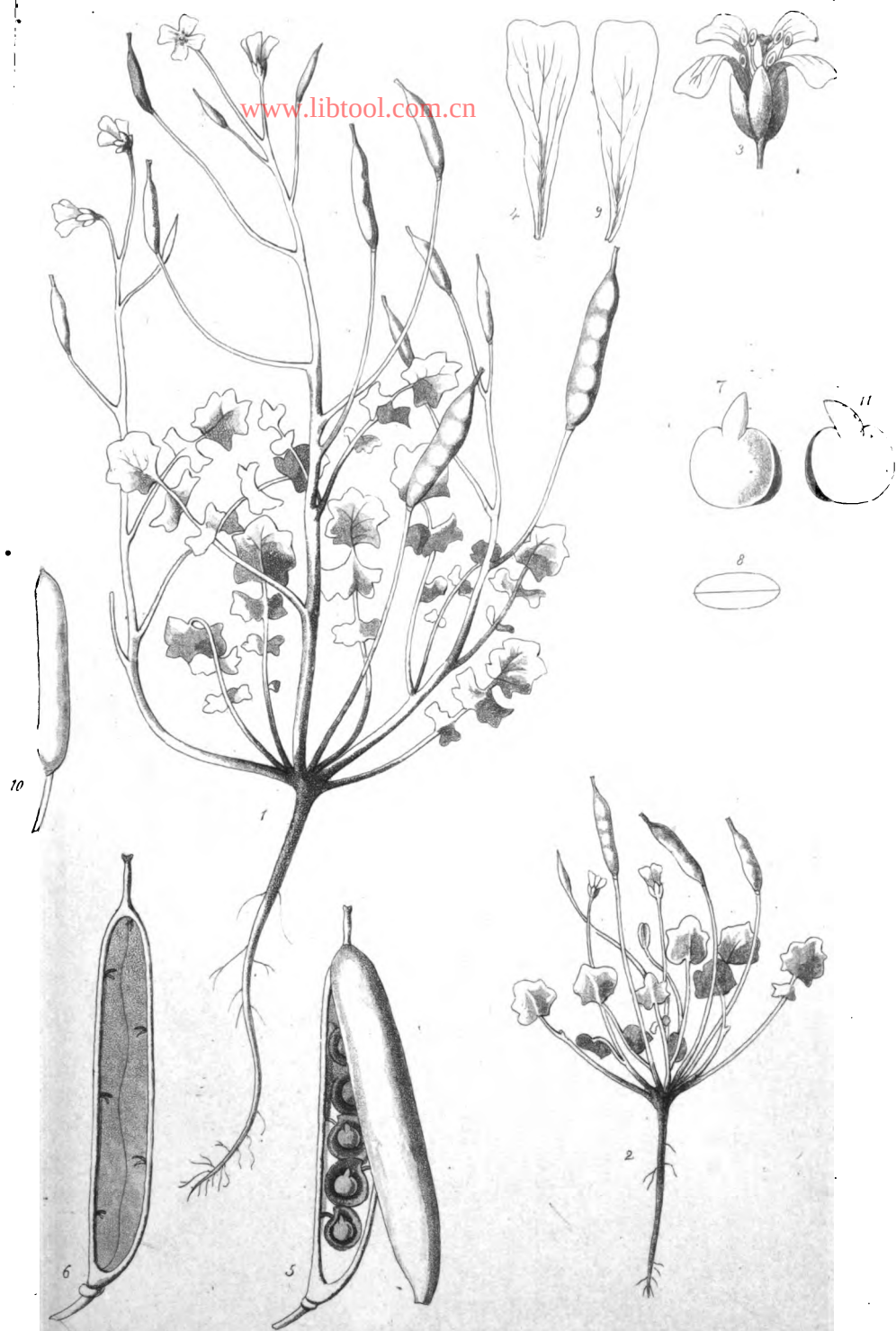


Macranthera Beccarii

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Drawn by John W. Hill.

LEAVENWORTHIA AUREA.

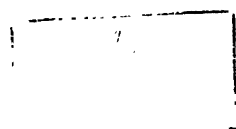
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