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BOTANY.—*Synopsis of the genus Datura.*¹ WILLIAM E. SAFFORD,
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A critical study of the genus *Datura* has revealed great confusion in botanical literature in connection with the specific identity, as well as the origin, of some of the most common species.² Some authors, for example, call a certain species endemic in Mexico and northern South America *Datura metel*; but the true *Datura metel*, described by Linnaeus in the first edition of his *Species Plantarum*, is a species based upon the Asiatic metel nut, or "jouz-methel," which was used as a narcotic by the Arabs, Persians, and Hindoos long before the discovery of America, and was described by Avicenna in the eleventh century. Forms of this species, differing from the type in color and in the reduplication of the corolla, have been set apart as a distinct species under the name *Datura fastuosa*, while the white-flowered type itself was rechristened *Datura alba*. Much of the confusion is due to the treatment which this genus received at the hands of Dunal in the first part of volume thirteen of De Candolle's *Prodromus* (1852), in which the name *Datura metel* was transferred from the Asiatic plant above mentioned to an American plant described in 1768 by Miller under the name *Datura innoxia*.

Conflicting statements regarding the origin of the well known Jamestown weed (*Datura stramonium* L.) are frequently encountered.³ Certain authors declare it to be of Asiatic origin, although Linnaeus in describing it states that it is American. Others assign the typical form, with green stem and white flowers, to Asia, and the purple-stemmed lavender-flowered form, commonly called *Datura tatula*, to America. Still others have separated a variety with smooth capsules from the typical prickly-fruited form under the name *Datura inermis*. Observations on growing plants show that both the white-flowered and purple-flowered forms may bear either smooth or prickly capsules, in some cases even on the same plant. Experiments in cross-breeding have demonstrated that of the antagonistic color characters, the

¹ Received March 14, 1921.

² See HEMSLEY, *Biol. Centr. Am. Bot.* 2: 427. 1882.

³ See ROBINSON & FERNALD, *Gray's Manual* ed. 7. 717. 1908. BRITTON & BROWN, *Illustr. Fl.* ed. 2. 3: 169. 1913.

purple is dominant and the white-flowered form recessive, and of the contrasted capsule forms the prickly one is dominant and the unarmed (*inermis*) recessive; so that at one end of the series we have the so-called *Datura tatula* and at the other the white-flowered "*Datura inermis*." This is discussed in the author's forth-coming paper, "*Datura, an inviting genus for the study of heredity*," to be published in the Journal of Heredity.

The tree daturas of South America have been segregated as a distinct genus under the name *Brugmansia*, chiefly on the score that they have fleshy spineless indehiscent fruits devoid of a persistent expanded calyx base; but the section *Ceratocaulis* is characterized by similar fruits and may be regarded as connecting the tree daturas with the section *Dutra*, in which the capsules are irregularly dehiscent and inclined or nodding, quite unlike the erect valvate capsules of the section *Stramonium*.

A study of the tree daturas shows that more than one species has been included under certain specific names. Thus *Datura arborea* of Ruiz and Pavon and *Brugmansia arborea* of Lagerheim are specifically distinct from the true *Datura arborea* L., based upon Père Feuillée's *Stramonioides arboreum*, and the pubescent orange-flowered *huantuc* of Ecuador, with sinuate woolly leaves, is also quite distinct from the typical *Datura sanguinea* of Ruiz and Pavon, with which it has been confused.

The following systematic synopsis is part of a paper submitted by the writer as a thesis for the degree of Doctor of Philosophy at George Washington University. The remainder of the paper, illustrated by numerous photographs of living plants, will appear in the forthcoming Year Book of the Smithsonian Institution.

DESCRIPTION OF THE GENUS

The genus *Datura*, established by Linnaeus (Gen. no. 246) with *Datura stramonium* as its type, belongs to the family Solanaceae and to the tribe Datureae, which includes also the closely allied genus *Solandra* of tropical and subtropical America. It may be characterized as follows:

Calyx long-tubular, herbaceous, appressed to the corolla tube or inflated, toothed at the apex or spathe-like and split down the side, in certain groups circumscissile at the base, leaving a disk which enlarges like a shield or cup subtending the fruit; in another group either disappearing entirely or persisting like a husk which covers the lower part of the fruit. Corolla funnel-shaped or trumpet-shaped, in certain species suggesting the corolla of a *Convolvulus*, the tube usually long and slender, the limb plicate and either 5-lobed with the lobes separated by sinuses, or circular or 10-angled, with the margin between the 5 teeth entire or obtusely angled, the angles sometimes cuspidate giving to the expanded limb the form of a 10-pointed star. Stamens

5, perfect, aduate to the inner surface of the tube at the middle or near the base, slightly or not at all exerted, the filaments slender and thread-like, the anthers linear, free or rarely cohering, the anther-cells parallel, longitudinally dehiscent. Ovary 2-celled (sometimes falsely 4-celled); style thread-like; stigma 2-lobed. Fruit a dehiscent 4-valved capsule or a more or less fleshy berry, the surface spiny or smooth. Seeds numerous, compressed laterally, discoid or imperfectly ear-shaped, sometimes with a cork-like covering; embryo curved, cotyledons semiterete.—Herbs, shrubs, or small trees, glabrous, farinaceous, or pubescent. Leaves broad, thin, entire, angulate, or coarsely sinuate-dentate. Flowers solitary, erect or drooping, sometimes very large.

KEY TO THE SECTIONS

Flowers erect; calyx circumscissile near the base, the base persistent and expanding like a frill, shield or cup.

Fruit an erect dehiscent 4-valved capsule. I. *Stramonium*.

Fruit inclined or nodding, not dehiscing regularly.

Plants terrestrial; pericarp spiny or tuberculate, with an expanded, frilled or shield-like calyx-base. II. *Dutra*.

Plants aquatic or marsh-loving; pericarp smooth, with small discoid or cup-like calyx-base. III. *Ceratocaulis*.

Flowers pendulous; calyx not circumscissile, either falling off entirely or persisting like a husk appressed to the fruit, the latter unarmed and indehiscent, spheroid, lemon-shaped, fusiform, or elongated and terete.

IV. *Brugmansia*.

SECTION I. STRAMONIUM Gaertner.

Flowers erect; calyx tube circumscissile near the base, falling off together with the corolla, the base persisting and expanding into a disc, the margin of which is at length turned downward and frilled. Corolla distinctly 5-lobed, the lobes separated by emarginate sinuses. Fruit (Fig. 1, A) an erect regularly dehiscent 4-valved capsule, armed with rigid spines or unarmed.

Type of the section, *Datura stramonium* L.

KEY TO THE SPECIES

Capsule normally armed with subequal spines, these sometimes much abbreviated or wanting; flowers white or lavender-colored. 1. *D. stramonium*.

Capsules armed with strongly unequal spines, the upper ones longer and stouter.

Leaves ovate or oblong; sinuate-toothed or angled. 2. *D. ferox*.

Leaves pinnately lobed.

Branches, petioles, and calyx downy or woolly. 3. *D. quercifolia*.

Branches, petioles, and calyx villous or hairy. 4. *D. villosa*.

1. *Datura stramonium* L. Sp. Pl. 1: 179. 1753.

Datura tatula L. Sp. Pl. ed 2. 1: 256. 1762.

Datura inermis Jacq. Hort. Vindob. 3: 44. pl. 82. 1776.

TYPE LOCALITY: "Habitat in America, nunc vulgaris per Europem."

RANGE: Throughout eastern North America, Central America, and South America; introduced at a very early date into the warmer regions of Europe, Asia, and Africa.

A common weed in waste places, used by the Algonquin Indians as a narcotic.⁴ The purple-flowered variety is commonly known under the name *D. tatula*, the form with unarmed fruits as *D. inermis*.

⁴ For the origin of its common name, Jamestown, or Jimson, weed, see BEVERLEY, Hist. Virginia, book 2, p. 24. 1706.

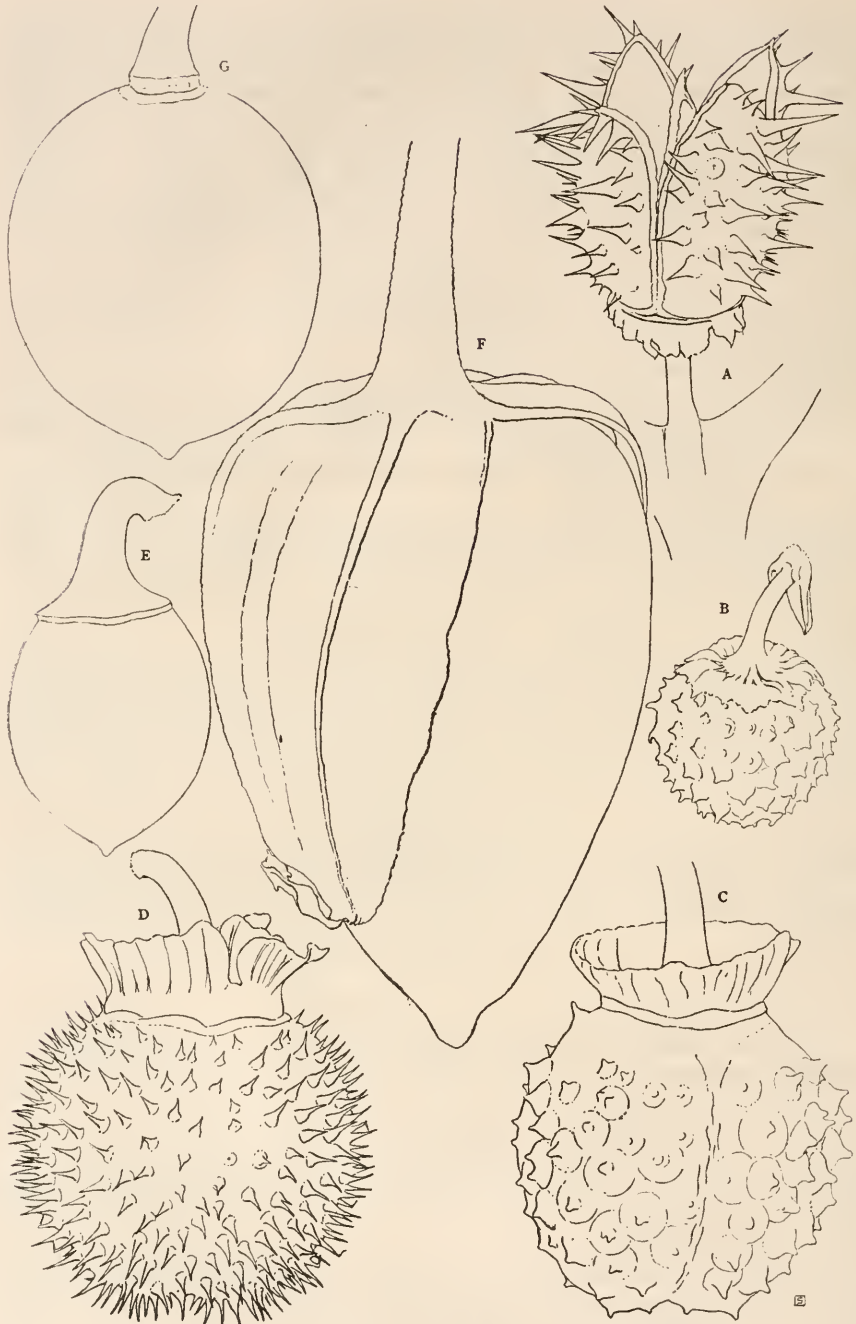


Fig. 1. Fruits of *Datura*. A, *Datura stramonium* L.; B, *D. metel* L.; C, *D. metel fastuosa* L.; D, *D. meteloides* Dunal; E, *D. ceratocaula* Jacq.; F, *D. sanguinea* R. & P.; G, *D. arborea* L. All natural size.

2. *Datura ferox* L. Amoen. Acad. 3: 403. 1764.

TYPE LOCALITY: "Habitat in China."

RANGE: Warmer regions of China; introduced into Sicily and Spain.

A weed growing in waste places, very similar to *D. stramonium*, with the pericarp bearing 4 very large stout spines at the apex. Called in Spain *Estramonio de la China*.

3. *Datura quercifolia* H. B. K. Nov. Gen. & Sp. 3: 7. 1818.

TYPE LOCALITY: "Crescit locis temperatis Regni Mexicani prope Zelaya et Molino de Saravia, alt. 930 hex."

RANGE: Texas to Arizona and Mexico.

A common weed along the banks of ditches. Leaves pinnately lobed; pericarps armed with large rigid ascending spines.

4. *Datura villosa* Fernald, Proc. Amer. Acad. 35: 571. 1900.

TYPE LOCALITY: Bolaños, Jalisco, Mexico.

RANGE: Jalisco and San Luis Potosi, Mexico, at altitudes of 1800 to 2500 meters.

A weed growing in waste places, related to *D. quercifolia*, with which it has been confused.

SECTION II. DUTRA Bernhardi.

Flowers erect; corolla trumpet-shaped or funnel-shaped, the expanded limb either 5-lobed or 10-angled; calyx-tube circumscissile, falling off with the corolla, the persistent base at length expanding into a membranous frill or cup, either reflexed or appressed to the fruit. Fruit (Fig. 1, B, C, D) borne on an inclined or nodding peduncle, not valvate but at length breaking open irregularly, its surface tuberculate or spiny, the spines sometimes flexible and not pungent, in some species pubescent.

Type of the section, *Datura metel* L.

KEY TO THE SPECIES

Fruiting peduncle usually curved to one side, sometimes cernuous; pericarp tuberculate or armed with short spines; plant glabrous or nearly so; corolla white or colored, normally 5-lobed, in cultivation often double or triple, the outer corolla 5-lobed or 6-lobed, the inner corollas 5-10-lobed, the lobes separated by acute sinuses.—An Asiatic species including several well-marked varieties.

5. *D. metel*.

Fruiting peduncle abruptly nodding; pericarp armed with spines; plants pubescent or pruinose; corolla white or tinged with lavender or purple, the expanded limb 10-angled.—Plants of American origin.

Flowers more than 6 cm. long.

Corolla funnel-shaped, white or tinged with purple or lavender; pericarp armed with weak spines; seeds light brown.

Plant softly pubescent; corolla white, 10-toothed. 6. *D. innoxia*.Plant glaucescent; corolla usually suffused with pale lavender, 5-toothed. 7. *D. meteloides*.

Corolla trumpet-shaped with broadly flaring 10-toothed limb, white with purple or violet throat; pericarp armed with stout spines; seeds black.

8. *D. discolor*.

Flowers not exceeding 6 cm. in length; corolla white; pericarp armed with short slender prickles, which together with the whole surface of the capsule are finely pubescent.

9. *D. pruinosa*.

5. *Datura metel* L. Sp. Pl. 1: 179. 1753.

FIG. 1, B, C.

Datura fastuosa L. Syst. ed. 10. 2: 932. 1759.*Datura alba* Nees, Trans. Linn. Soc. 17: 73. 1834.

TYPE LOCALITY: "Habitat in Asia, Africa."

RANGE: Tropical and subtropical Asia and Africa; now widely cultivated throughout the warmer regions of both hemispheres.

In the first edition of the *Species Plantarum* Linnaeus briefly described this species as "*Datura pericarpis spinosis nutantibus, globosis*," and cited his earlier description of it in the *Hortus Cliffortianus* (1737). In the latter work it is identified with the "*Solanum pomo spinoso rotundo longo flore*" of Bauhin (1623); "*Stramonium multis dicta sive pomum spinosum*" of Bauhin's *Historia* (1651); the "hummatu" of Rheede's *Hortus Malabaricus* (2: 47. pl. 28. 1678); "*Stramonium seu Datura, pomo spinoso rotundo, longe flore*" of Hermann (1687); and "*Stramonium fructo spinoso rotundo, flore albo simplici*," of Tournefort and Boerhaave. The range is cited as "Crescit in Oriente, in Malabar, Aegypto, etc."

In the second edition of the *Species Plantarum* (1762) Linnaeus adds to his citations Rumph's *Herbarium Amboinense* (5: pl. 87. 1755), in which the simple-flowered *Datura metel* is figured, accompanied by the double-flowered form called *Datura fastuosa* by Linnaeus in the tenth edition of his *Systema* (1759). He also adds to his description "foliis cordatis subintegris pubescentibus," but this is not applicable to the true *Datura metel*. This interpolation, if it can be so called, is responsible for much of the resulting confusion of this and allied species. Dunal, in his description of *Datura metel* in DeCandolle's *Prodromus*, does not cite the original description of Linnaeus's *Datura metel* in the first edition of the *Species Plantarum*, but that of the second edition, in which the plant is erroneously described as pubescent. In the first edition Linnaeus takes great care to identify his *Datura metel* with the "metel nut" of Asia. Dunal, on the other hand, amends the original description of the species, and refers to it a plant collected by Berlandier in the vicinity of Victoria, in eastern Mexico, undoubtedly distinct from the true *Datura metel* L., but identical with the pubescent white-flowered *Datura innoxia* Miller, described from a type also collected in eastern Mexico. The latter species can-



Fig. 2. *Datura metel* L. Illustration of J. Bauhinus under the name "*Stramonium multis dicta sive Pomum spinosum*," *Hist. Pl.* 3: 624. 1651, cited by Linnaeus in his *Hortus Cliffortianus*.

not possibly be identified with *Datura alba* Nees, as suggested by Dunal, as that species is the typical white-flowered form of *Datura metel* L.; and *Datura innoxia*, described below, has its "stalks, branches, and leaves, covered with soft hairs."

It is interesting to note that in the *Hortus Cliffortianus* the first two synonyms cited identify Linnaeus's *Datura metel* with the *Stramonium*, or *Pomum spinosum*, described and figured by Johannes Bauhin, and clearly identified by him with the *Stramonium* of Fuchsius and the *Nux methel* of Avicenna. Bauhin's figures agree with that of Fuchsius (1542) in the form and surface of the fruit, which bears very short and thick spines, not subulate or needle-like prickles; indeed his second figure, here reproduced, is a reduced copy of Fuchsius's.⁵

It is surprising that C. B. Clarke,⁶ in Hooker's *Flora of British India*, not only ignores Linnaeus's references to the authorities above mentioned in connection with *Datura metel*, but transfers this specific name from the metel-nut or *dhatura* of India to a plant of American origin, citing as an illustration of the species, not the figures of Fuchsius, Bauhinius, or Rumphius, but an illustration in Curtis's *Botanical Magazine* (plate 1440) which on investigation proves to be the drawing of a plant grown in London under the name *Datura innoxia*, from seeds of American origin, identical with the Vera Cruz plant described by Miller in 1768 under the latter name. The specific identity of the white and purple forms of the Asiatic *Datura metel* L. is recognized by the best authorities on East Indian botany; but that the perfectly valid name *Datura metel* should be discarded for the varietal name *D. fastuosa*, as by Trimen,⁷ is inexcusable.

It was this Asiatic plant, called in India *Dhatura*, or *Dutra*, that gave to the genus its name. True to his principle of not adopting a barbarous word for a generic name, Linnaeus latinized the East Indian *Dhatura* or *Dutra*; modifying it, however, to the form *Datura*, and commending the name by the following pun: "Daturae, licet originis sit peregrinae, vocabulum persistere valet, cum a latina derivari potest; dantur et *daturae* forte in Indiis posthac semina a lascivis foeminis maritis inertibus."⁸

6. *Datura innoxia* Mill. Gard. Dict. ed. 8. *Datura* no. 5. 1768.

Datura metel Sims, Curtis's Bot. Mag. 35: pl. 1440. 1812. Not *D. metel* L.

D. guayaquilensis H. B. K. Nov. Gen. & Sp. 3: 8. 1818.

D. metel Dunal in DC. Prodr. 13¹: 543. 1852.

⁵ Compare the second figure of J. BAUHINIUS, Hist. Pl. 3: 624. (1651), with the colored engraving in FUCHSIUS, Hist. Stirp. 690 (1542), which is clearly the true *nux methel*, or East Indian *dhatura*, and is quite distinct from the American plant erroneously called *Datura metel* in modern text-books.

⁶ HOOKER, Fl. Br. Ind. 4: 243. 1885.

⁷ Handb. Fl. Ceyl. 3: 238. 1895.

⁸ Hort. Cliffort. 56. 1737.

TYPE LOCALITY: "The fifth sort grows naturally at Vera Cruz, from whence I received the seeds."

RANGE: Mexico to South America and the West Indies. Introduced at an early date into the Canary Islands, North Africa, and India.

This "downy thorn-apple," as it was called by Sims, has been frequently confused with the Old World *Datura metel* of Linnaeus, from which it may be readily distinguished by its 10-angled corolla and the soft pubescence of its foliage and young branches. It was characterized by Miller in 1768 as follows: "*Datura (Inoxia) pericarpis spinosis inoxiis ovatis propendentibus foliis cordatis pubescentibus.*" A plant grown from seeds from Vera Cruz was described by him as follows: "This rises with a purplish stem three to four feet high, dividing into several strong branches, garnished with oblong heart-shaped leaves. The stalks, branches, and leaves of this sort are covered with soft hairs; the flowers come out at the division of the stalks and branches, standing erect; they are large, white, and are succeeded by oval fruit covered with long soft innocent spines, opening into four cells, which are full of brown seeds."

The above description accords with that of the Mexican *Nacazcul*, or *Toloatzin*, the leaves of which were characterized by Hernandez⁹ as "mollia, pinguia, et hirsuta." It was figured by Sims in 1812, as above cited, from a plant grown in London from seeds of American origin. Sims referred it to Linnaeus's *Datura metel*, but he was not at all confident that he was correct in doing so. "Our plant was said to be raised from seeds sent from Surinam," he says, "and we think it doubtful whether it be the same species as the East Indian plant, which grows to a much larger size and is not described as being so pubescent. . . . We were favored with the plant from which our drawing was taken, by Mr. Salisbury, proprietor of the botanic garden in Sloane Street, under the name of *Datura innoxia* of Miller; and it is not unlikely but it may be the same as the one described by him, which he raised from seeds received from Vera Cruz."

Notwithstanding the uncertainty thus expressed by the author, the name *Datura metel* was subsequently transferred by several botanists from the Asiatic metel-nut, upon which Linnaeus had bestowed it, to this American "downy thorn-apple," a species which may be readily distinguished from the true *Datura metel* L. not only by its soft pubescent but by its 10-toothed corollas. It seems strange that even in Hooker's *Flora of British India* the name *Datura metel* is applied to this introduced plant of American origin, while the true *Datura metel* is called by a varietal name *D. fastuosa*, with *D. alba* Nees given as the name of its typical form, in which the corolla is white and single.

7. *Datura meteoides* Dunal. in DC. Prodr. 13¹: 544. 1852. FIG. 1, D.

Datura wrightii Hort. ex Regel, Gartenfl. pl. 260. 1859.

TYPE LOCALITY: "In calidis Novae Hispaniae regionibus."

RANGE: Western Texas to California, Mexico, and northern South America.

⁹ HERNANDEZ, Res. Med. Nov. Hisp. Thesaurus, 113. 1651.

A handsome plant bearing large heavily scented flowers with a decagonal corolla limb, white, usually suffused with lavender or pale violet. Stems and foliage glaucescent. Fruit nodding, indehiscent (Fig. 1 D).

This species is held sacred by several Indian tribes of the southwestern United States. It is without doubt the *Ololiuhqui* of the Aztecs, who used it ceremonially and medicinally very much after the same manner as it is still used by our own Indians in New Mexico, Arizona, and California. An account of the Zuñi myth associated with it and its use by the Luiseño Indians of southern California in initiating their youths to manhood will appear in the paper by the writer to be published in the forthcoming Annual Report of the Smithsonian Institution.

8. ***Datura discolor*** Bernh. Trommed. N. Journ. Pharm. **26**: 149. 1838.

Datura thomasi Torr. Pacif. R. R. Rep. **5**: 362. 1856.

TYPE LOCALITY: "Habitat in India occidentali."

RANGE: West Indies, Mexico, and the southwestern United States.

A plant somewhat resembling *D. meteloides*, but with the corolla 10-toothed and trumpet-shaped instead of funnel-shaped, and usually stained with purple at the throat. It is easily distinguished from the former, with which it is not infrequently associated, by its smaller flower, black seeds, and the long stout spines with which its smaller nodding fruit is armed.

9. ***Datura pruinosa*** Greenm. Proc. Amer. Acad. **33**: 486. 1898.

TYPE LOCALITY: Cuicatlan, Oaxaca, Mexico.

RANGE: State of Oaxaca, altitude 550 to 1550 meters.

This plant may readily be distinguished from its allies "by the small flowers and the fine pruinose pubescence of the young leaves and the tips of the young branches."

SECTION III. CERATOCAULIS Spach.

Fruit (FIG. 1, E) a pendent or abruptly deflexed smooth berry, subtended by the enlarged persistent base of the calyx; flowers erect, trumpet-shaped, the calyx spathe-like and split down one side, the corolla tube long and narrow, the limb 10-toothed; stamens exerted, subequal. This section was segregated from the rest of the *Daturas* by Rafinesque, under the name *Apemon*.

KEY TO THE SPECIES

A single species.—Leaves pinnately lobed, farinose beneath; corollas large, white stained with blue. An aquatic plant of Mexico and Central America. 10. *D. ceratocaula*.

10. ***Datura ceratocaula*** Ort. Dec. 11. 1798. FIG. 1, E.

Datura macrocaulis Roth, Neue Beitr. 159. 1802.

Apemon crassicaule Raf. Fl. Tell. **2**: 11. 1836.

Datura sinuata Sessé & Moc. Pl. Nov. Hisp. ed. 2. 24. 1893.

TYPE LOCALITY: "Prope urbem Mexici et in insulâ Cuba.

RANGE: States of Mexico, Querétaro, and Oaxaca, usually in shallow water.

A fleshy plant with thick dichotomous stem and horn-like branches, the narcotic "Torna-loco" ("Maddening-plant") of the Mexican marshes. It

was one of the plants called "Atlinan" by the Aztecs, who called it "Sister of the Ololiuhqui" and invoked its spirit in treating certain diseases.¹⁰

SECTION IV. BRUGMANSIA (Persoon).

Flowers pendulous, very large; calyx not circumscissile near the base, either falling off entirely or persisting as a husk-like envelope about the base of the fruit; fruit unarmed, smooth, spheroid, oblong, fusiform, or linear and terete.

Type of the section, *Datura candida* (Persoon).

KEY TO THE SPECIES

Calyx spathe-like, terminating in a point.

Flower white.

Corolla more than 20 cm. long; margin of limb between the teeth entire or rounded. 11. *D. candida*.

Corolla not exceeding 17 cm. in length; margin of limb between the teeth cordate or emarginate.

Calyx tapering into a horn-like point. 12. *D. cornigera*.

Calyx without a horn-like apex. 13. *D. arborea*.

Flower colored.

Corolla large, more than 25 cm. long.

Peduncle, petioles and young branches glabrous; corolla at length turning red. 14. *D. versicolor*.

Peduncle, calyx, nerves of the corolla, and margins of corolla teeth clothed with soft hairs; corolla pink. 15. *D. mollis*.

Corolla small, not exceeding 15 cm. in length, red. 16. *D. rubella*.

Calyx toothed at the apex.

Flower white.

Anthers coherent; corolla teeth short, about 1 to 2 cm. long. 17. *D. suaveolens*.

Anthers distinct; corolla teeth 2 to 5 cm. long.

Fruit ovoid. 18. *D. affinis*.

Fruit long and slender.

Leaves lanceolate to ovate-lanceolate, entire. 19. *D. dolichocarpa*.

Leaves linear-oblong, sinuate-repand. 20. *D. longifolia*.

Flower colored.

Calyx deciduous, more than half the length of the corolla.

Apex 5-toothed; fruit narrowly ovoid, beaked. 21. *D. aurea*.

Apex 2-toothed; fruit elongate-ovoid, not beaked. 22. *D. pittieri*.

Calyx persistent, less than half the length of the corolla.

Uppermost leaves entire or repand, puberulent. 23. *D. sanguinea*.

Uppermost leaves angular-toothed, densely tomentose.

24. *D. rosei*.

11. *Datura candida* (Pers.) Safford.

Datura arborea Ruiz & Pavon, Fl. Peruv. 2: 15. pl. 127. 1799. Not *D. arborea* L. 1753.

Brugmansia candida Pers. Syn. Pl. 1: 216. 1805.

TYPE LOCALITY: "Habitat in Peruviae hortis, versuris et septis, passim ad Cercado, Chancay, et Huanuci Provincias."

RANGE: KNOWN only in cultivation; now widely spread in tropical and sub-tropical countries.

¹⁰ JACINTO DE LA SERNA, in Documentos Ined. para la Hist. de España 104: 159-160.

This is the large white-flowered Floripondio of the gardens of Northern Chile, Peru, Honduras, Guatemala, and Mexico. It was figured by Ruiz and Pavon, as above cited, under the name *Datura arborea*, but is quite distinct specifically from Père Feuillée's plant, which was the type of Linnaeus's *D. arborea*. It is also distinct from Lagerheim's *Brugmansia arborea* (see beyond, no. 18), the calyx of which is 2- to 5-toothed, and the peduncle glabrous. The specimens in the National Herbarium, like that figured by Ruiz and Pavon, are characterized by a relatively short, loose, pointed, spathe-like calyx. In the illustration of the fruit of the latter the calyx is represented as persistent, but this may possibly be an error.

12. *Datura cornigera* Hook. Curtis's Bot. Mag. *pl.* 4252. 1846.

TYPE LOCALITY: Described from a cultivated plant of unknown origin.

RANGE: According to Hemsley, it occurs in the Valley of Mexico.

Hooker points out the characters of this plant, which distinguish it from closely allied species, and adds: "It is not the *Datura arborea* of Linnaeus and of Feuillée, plate 46; nor the *Datura arborea* of Ruiz and Pavon's plate 128, which has a much larger flower, with the calyx deeply cleft but appressed to the corolla. In the present species it runs out at the apex into a long, subulate spreading point."

13. *Datura arborea* L. Sp. Pl. 1: 179. 1753.

FIG. 1, G.

TYPE LOCALITY: "Habitat in Peru."

RANGE: Peruvian Andes. Now widely cultivated in tropical and subtropical countries.

This species was based by Linnaeus on the *Stramonioides arboreum* described and figured by Père Feuillée in his *Journal des Observations Physiques, Mathématiques et Botaniques*, 1714, and is quite distinct from *D. arborea* Ruiz & Pavon. The flowers of the type were about 15 cm. (6 inches) long, with the corolla limb distinctly 5-lobed, the lobes separated by distinct sinuses or notches, the peduncle clothed with whitish velvety pubescence, and the broadly ovoid fruit quite devoid of calyx, about 6.25 cm. long and 5.6 cm. in diameter.

14. *Datura versicolor* (Lagerh.) Safford.

Brugmansia versicolor Lagerh. Bot. Jahrb. Engl. 20: 666. 1895.

TYPE LOCALITY: "Habitat in Aequatoria, ad 'Balsapamba' in regions tropicae provinciae Los Rios."

RANGE: Known only from the type locality.

A beautiful species with fragrant flowers, the corolla of which, at first white, gradually turns to a brick red color. It is closely allied to *D. dolichocarpa*, but differs from it in the form of its spindle-shaped fruit, which terminates in a very long slender point. The petioles and peduncles are quite glabrous.

15. *Datura mollis* Safford, sp. nov.

Shrub or small tree, with pubescent, ovate-lanceolate, entire or remotely

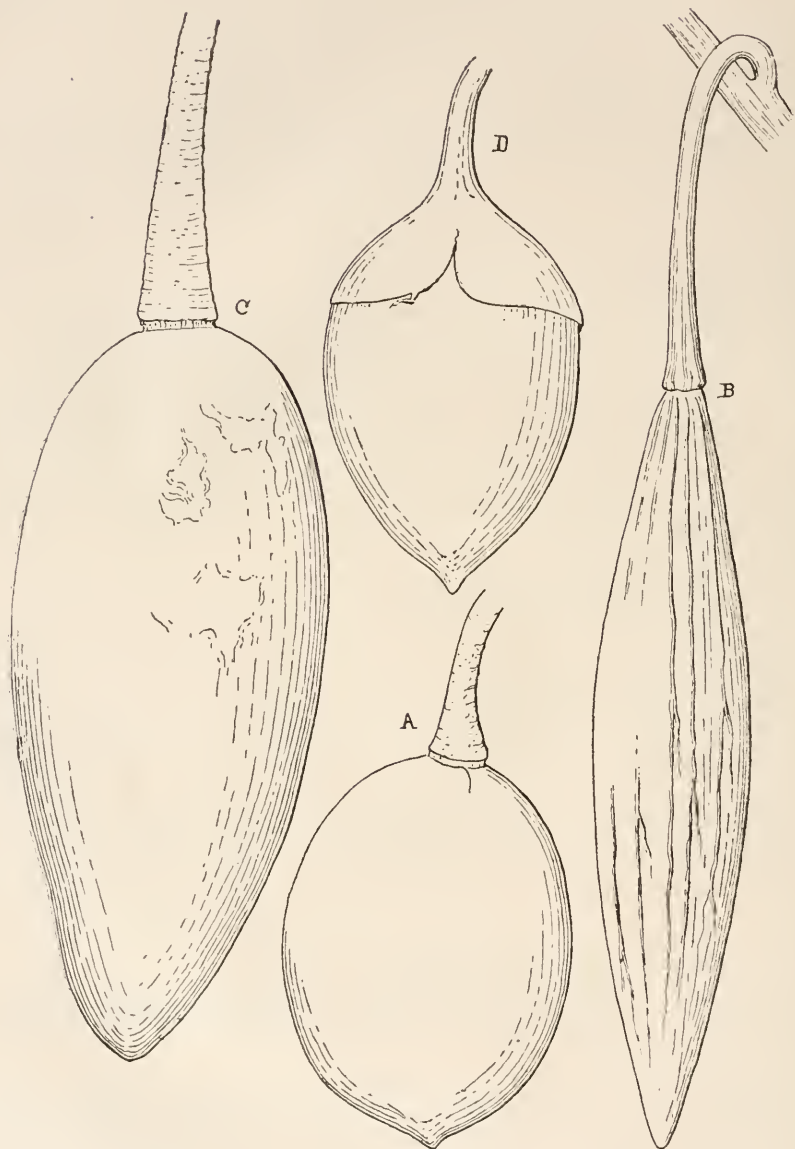


Fig. 3. Fruits of South American Tree Daturas belonging to the section *Brugmansia*. A, *Datura rubella* Safford; B, *D. suaveolens* H. & B.; C, *D. pitleri* Safford; D, *D. rosei* Safford. All $\times \frac{3}{4}$.

toothed leaves, 22 cm. long, and 10.5 cm. wide; calyx spathe-like, 19 to 20 cm. long, obtusely pointed at apex, somewhat inflated, densely clothed, like the peduncle, with soft spreading hairs; corolla 25 or 26 cm. long, light pink, resembling that of *D. candida* in form, the lower half of the tube very slender, the upper part subcylindrical, about 4 cm. in diameter, the limb, flaring to about 12 cm. in diameter, bearing on its margin 5 caudate teeth 6 or 7 cm. long, at length recurved; nerves of the corolla and margins of the teeth clothed with soft spreading hairs; margin of the limb between the teeth not emarginate; pistil 25 cm. long, slightly exceeding the stamens; stigma slender, 16 mm. long; stamens 23 cm. long, anthers free, 37 mm. long.

Type in the U. S. National Herbarium, no. 1,022,914, collected in the vicinity of Portovelo, Ecuador, October, 1918, by J. N. Rose (no. 23,418).

16. *Datura rubella* Safford, sp. nov.

FIG. 2, A.

Shrub 8 to 10 feet high, with pubescent, ovate-lanceolate, acuminate, entire or repand leaves, the upper ones about 10 cm. long by 4 cm. wide; calyx pubescent like the peduncle, spathe-like, 10 cm. long, split down one side and terminating in a long caudate-acuminate point; corolla red, 13 or 14 cm. long, not widely flaring, the expanded limb about 5 cm. wide, bearing 5 slender caudate teeth about 15 mm. long; nerves of the corolla and teeth clothed with minute spreading hairs; pistil 11 to 11.5 cm. long, terminating in a thick obtuse clavate stigma, slightly exceeding the stamens; stamens 10.5 cm. long, the lower part of the filaments hairy, the anthers free, linear, 2 cm. long, pale straw color; fruit (FIG. 2, A) broadly oval or lemon-shaped, 7 cm. long, 5 cm. in diameter, with a small nipple at tip.

Type in the U. S. National Herbarium, no. 1,022,434, collected in the vicinity of Cuenca, Ecuador, September, 1918, by J. N. Rose (no. 22,828). Fruit (in formalin) and seeds in Economic Collection, Bureau of Plant Industry.

17. *Datura suaveolens* Humb. & Bonpl.; Willd. Enum. Hort. Berol. 227. 1809.

FIG. 2, B.

Datura gardneri Hook. Curtis's Bot. Mag. sub pl. 4252. 1846.

TYPE: A cultivated plant, erroneously stated to be of Mexican origin.

RANGE: Provinces of Minas Geraes and Sao Paulo, Brazil; now much cultivated in the tropics and in conservatories; common in the Antilles.

The native country of this species, distinguished from all others by its coherent anthers and relatively short, much inflated, 5-toothed calyx, was long doubtful, and its fruit has remained undescribed. Fruiting specimens in the U. S. National Herbarium were collected near Caldas, in the province of Minas Geraes, not far from the boundary of Sao Paulo, May 12, 1873, by Dr. Anders Frederik Regnell of that city, and presented by him to the Botanical Museum of Upsala. The 2-celled fruit (FIG. 2, B) is spindle-shaped, 12 to 12.5 cm. long, 2.5 cm. in diameter at the middle, gradually tapering toward each end. It is devoid of all vestige of calyx and is borne on a recurved peduncle 7 cm. long. The dry brown pericarp is thin and fragile, glabrous, and longitudinally veined with delicate raised nerves. The large irregular angular seeds are closely packed in the two cells.

18. *Datura affinis* Safford, sp. nov.

Brugmansia arborea Lagerh. Bot. Jahrb. Engl. 20: 663. pl. II, fig. 1. 1895.
Not *D. arborea* L. 1753, or *D. arborea* Ruiz & Pavon. 1799.

TYPE LOCALITY: Vicinity of Quito, Ecuador.

This species, described by Lagerheim from specimens growing in the vicinity of Quito, Ecuador, is very closely allied to *D. aurea* (no. 21). The flowers differ from those of *D. arborea* L. in their glabrous peduncle, their 2- to 5-toothed calyx, and in the margin of the corolla limb, which is not emarginate or heart-shaped between the teeth, but entire or rounded, as in *D. candida*. The fruit, like that of *D. aurea*, is narrowly obovate, acuminate, and pubescent. The local name is "floripondio blanco."

Lagerheim states that this species accords well with specimens labeled *D. arborea*, from Pavon's Herbarium, seen by him in the Paris Museum. This would identify it with *D. arborea* R. & P. rather than with *D. arborea* L. All specimens of *D. arborea* R. & P. (*D. candida* (Persoon) Safford) examined by the writer have the apex of the calyx not toothed, but terminating in a point, and the peduncle not glabrous but pubescent.

19. *Datura dolichocarpa* (Lagerh.) Safford.

Brugmansia dolichocarpa Lagerh. Bot. Jahrb. Engl. 20: 665. pl. II, fig. 6-9. 1895.

TYPE LOCALITY: "Habitat in Aequatoria, prope 'Santo Domingo de los Colorados,' in regione tropica provinciae Pichincha. . . . et prope 'Puente de Chimbos' in regione tropica provinciae Chimborazo."

RANGE: Tropical Ecuador.

This beautiful species grows in the form of small trees of elegant habit. It is closely allied to *D. suaveolens* H. & B. and to *D. versicolor* (Lagerh.). From the former it is distinguished by its very long terete fruit (29-31 cm. long), its free anthers, its very long corolla teeth, and the form of its seeds.

20. *Datura longifolia* (Lagerh.) Safford.

Brugmansia longifolia Lagerh. Bot. Jahrb. Engl. 20: 666. 1895.

TYPE LOCALITY: "Habitat in Aequatoria, ad 'Santo Domingo de los Colorados' in regione tropica provinciae Pichincha (Sodiuro, in Mus. botan. Univ. Quitensis)".

RANGE: Known only from the type locality.

This species, with white flowers 27-30 cm. long and 2- to 5-toothed calyx, is distinguished from all the rest by its very long and narrow leaves. Its fruit is still undescribed.

21. *Datura aurea* (Lagerh.) Safford.

Brugmansia aurea Lagerh. Gartenfl. 42: 33. 1893.

TYPE LOCALITY: "Habitat in Aequatoria, Quito in hortis passim culta."

RANGE: "In silvis regionis subtropicae probabiliter spontanea."

This handsome species bears long golden-yellow flowers, with spathe-like calyces 5-toothed at the apex. It is commonly called "floripondio amarillo"

by the natives of Quito. A specimen in the U. S. National Herbarium (no. 1,023,042) was collected in the garden of the American Legation at Quito in October, 1919, by Dr. J. N. Rose, who also obtained seeds (No. 28,553) and a photograph.

Lagerheim says that it may be identical with *Datura chlorantha* Hook.¹¹ but this is impossible. Hooker's plant does not belong to the section *Brugmansia*. It is a form of the Old World *Datura metel fastuosa*, the double flowers of which are borne on a short, thick, erect peduncle, although inverted in the illustration, and the calyx is 5-toothed like that of *Datura metel* L. Typical specimens of *D. chlorantha* were seen by the writer during a recent visit to the Island of Hawaii, growing by the roadside on the west coast of the Island. The flowers were of a greenish yellow color, identical in form with that figured by Hooker, and the fruit a prickly indehiscent capsule subtended by the enlarged persistent base of the calyx. The habit of the plant was low and spreading, as in the description of the Australian plant quoted by Hooker, not at all tree-like as in the section *Brugmansia*.

22. *Datura pittieri* Safford, sp. nov.

FIG. 2, C.

Shrub or small tree with ovate-lanceolate acuminate entire leaves unequal at the base, sparsely hairy when young, at length glabrous or nearly so, 17 to 18 cm. long, 7.5 cm. broad, on glabrous petioles 2.5 cm. long; calyx spathe-like, more than half the length of the corolla (10 cm. long), glabrous, terminating at the apex in 2 obtuse teeth; corolla 18 cm. long, the tube narrow below, subcylindric and 2.5 cm. broad above the middle, the limb flaring and trumpet-like, 6 cm. in diameter, bearing 5 very long caudate teeth, about 4 cm. long, not revolute but curving inward; pistil 14 cm. long, the style slender and thread-like, the stigma short and thick, about 7 mm. long; stamens 13.5 cm. long, the anthers free, linear, 26 mm. long; fruit (Fig. 2, C) elongate ovoid, 13 cm. long, 5.5 cm. thick, devoid of terminal nipple or beak, terete, 2-celled, the cells closely packed with irregularly angled oblong seeds; pericarp thick, glabrous.

Type in the U. S. National Herbarium, no. 531,502, collected in the vicinity of Huila, an Indian village in the Rio Paez Valley, Tierra Adentro, Colombia, at an altitude of 1600 to 1900 meters, January, 1906, by Henri Pittier (no. 1305). Fresh fruit photographed by Professor Pittier; negative no. 8708, in the files of the Bureau of Plant Industry.

23. *Datura sanguinea* Ruiz & Pavon, Fl. Peruv. 2: 15. 1799.

Brugmansia bicolor Pers. Syn. Pl. 1: 216. 1805.

TYPE LOCALITY: "Habitat in altis, frigidis et ruderatis locis provinciarum Tarmae, Xauxae, Huarocheri, Cantae, et Huamalies."

RANGE: Andes of Peru and Ecuador; now much cultivated in tropical and subtropical countries.

This red-flowered tree datura was collected in 1915 by Mr. O. F. Cook in the Andes of Peru, attaining its perfection at an altitude of 12,000 feet, where there is frost every night. In his field notes Mr. Cook describes *Datura sanguinea* as a woody species, forming a tree somewhat smaller than *D*

¹¹ Curtis's Bot. Mag. 85: pl. 5128. 1859.

arborea, from which it differs not only in the color and form of its flowers, but also in its more open habit and its narrower foliage; leaves narrowly oblong, tapering at each end, 18 cm. long and 5 cm. broad, the upper ones entire or slightly repand, puberulent, the petiole 8 cm. long; peduncle 3 to 4 cm. long, puberulent; calyx 9 cm. long, less than half the length of the corolla, inflated, terminating in two obtuse teeth; corolla glabrous, about 25 cm. long, the tube green from the base to beyond the end of the calyx, then light yellow, followed by red on the upper part including the limb and the teeth, the red portion having prominent longitudinal yellow nerves; diameter of the limb (including the teeth) 11 cm.; style 18-20 cm. long (shorter than the corolla tube), terminating in a thick knob-like stigma, slightly exceeding the stamens; anthers distinct, hairy, broadly linear, 25 mm. long; fruit broadly ovate or turbinate, 9 cm. long, 6 cm. thick at its greatest diameter, terminating in an obtuse nipple, the greater part enveloped in the split persistent husk-like calyx. Specimens in the National Herbarium (no. 1,022,006) collected at Ambato, Ecuador, in 1918, by J. N. Rose (no. 22,344) agree in all respects with those collected in Peru by Mr. Cook. Photographs of the flowers and fresh fruit, natural size, made by Mr. Cook in the field, will appear in the writer's forthcoming paper to be published in the Smithsonian Annual Report.

24. *Datura rosei* Safford, sp. nov.

FIG. 2, D.

Brugmansia bicolor Lindl. Bot. Reg. 20: pl. 1739. 1834. Not *B. bicolor* Pers. 1805.

Brugmansia sanguinea D. Don in Sweet, Brit. Fl. Gard. II. 3: pl. 272. 1835; Lagerh. Bot. Jahrb. Engl. 20: 662. 1895. Not *Datura sanguinea* R. & P. 1799.

Shrub or small tree with short leafy branches, the younger growth densely clothed with whitish spreading hairs; leaves ovate-oblong, obtuse, repand and sinuate, with short obtuse lobes, copiously clothed on both sides by soft whitish hairs, 5 to 23 cm. long, 2.5 to 12.5 cm. broad, the base rounded and often unequal, the upper ones angular-toothed and densely tomentose; petioles 2.5 to 7.5 cm. long, stout, densely subtomentose-pilose; flowers solitary, pendulous; peduncles about 2.5 cm. long, densely subtomentose-pilose; calyx densely pubescent, ventricose, less than half the length of the corolla, 7.5 to 9 cm. long, terminating at the apex in 2 to 5 obtuse teeth; corolla funnel-shaped, 15.5 to 18.5 cm. long, pubescent, orange or saffron-colored, with 15 prominent longitudinal green nerves; limb 6 to 6.5 cm. broad, divided into 5 obtuse spreading lobes each terminating in a recurved tooth 10 to 15 mm. long, the margin of limb emarginate or notched between the lobes; pistil slightly exceeding the corolla tube, 16.5 to 19.5 cm. long, terminating in a thickened obtuse stigma; stamens 5, equaling the corolla tube or very slightly exserted, the anthers closely associated round the style, hairy, 1.25 to 1.5 cm. long; fruit (FIG. 2, D) ovoid, pubescent, about 7 cm. long, 4.5 cm. in diameter, abruptly pointed at the apex, the base covered with the husk-like remains of the calyx.

Type in the U. S. National Herbarium, no. 1,022,538, collected in the vicinity of Cumbe, south of Cuenca, Ecuador, September 24, 1918, by J. N. Rose (no. 22,965).

RANGE: Mountains of Ecuador.

This species has been confused with *D. sanguinea*, from which it differs in

the form and indument of its leaves, the size and color of its flowers, and the size and form of its fruit. Dr. Rose, who collected both species, refers to this species in his field notes, as follows: "Brugmansia sp.—Flowers of a saffron yellow; corolla lobes acuminate, reflexed; calyx 3-lobed, green: flowers smaller, throat relatively broader, and calyx lobes more attenuate than in the red-flowered species collected at Ambato; the leaves are also relatively broader, and are distinctly lobed, or angular-toothed, and tomentose.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. The abstracts should conform in length and general style to those appearing in this issue.

ASTRONOMY.—*Results of observations with the nine-inch transit circle, 1903-1911.* W. S. FICHELBERGER and H. R. MORGAN. Publ. U. S. Naval Observatory, II. 9¹. Pp. 920. 1921.

This publication contains the results and discussions of 49,437 observations of the sun, moon, planets and 4,526 standard stars made with the 9-inch transit circle of the U. S. Naval Observatory.

The following new equipment was used in the work: a self-winding clock kept at almost constant temperature and pressure, the hourly rate of which is known within 0.001 sec.; a personal equation machine for determining the personal equations of observers in observing stars at all declinations and in observing the sun, moon, and planets; a high-power microscope for determining the forms of the pivots; and a screen system for partially eliminating the magnitude equation of the observer. Extensive determinations were made of the forms of the new pivots; of the errors of each of the 10,800 divisions of the recently graduated circle; of the flexure of the instrument; of the errors of the new micrometer screws; and of the positions of the two meridian marks. The personal equations of the observers, both in right ascension and declination, were derived from extensive inter-comparisons of the observations in connection with the results from the personal equation machine.

From the discussion of 4,000 circumpolar observations it was found that the refractions given by the Pulkowa Tables require a correction of $-0''.134 \tan z$ to satisfy the observations under the conditions under which they were taken at Washington. A comparison of the observations of 2,800 zodiacal stars made at Cape of Good Hope and at Washington confirmed this result. The variation of the refraction for different hours of the night and different times of the year was found negligible. The latitude of the Observatory deduced from this discussion is $+38^{\circ} 55' 14''.34$.

From 7,000 observations, made on 410 nights, new and accurate positions were determined for the clock stars, and these positions were used in forming the clock corrections for the reduction of the work. The positions of the pole stars used in the azimuth reduction were determined, also independently of any other positions, from observations above and below pole. The discussion of the observations of the sun and moon gave a correction of -0.03 sec. to the equinox, and $-0''.4$ to the obliquity of the ecliptic, as