Order LXXIX.—CISTACEÆ, *Lindley*.—THE ROCK-ROSE TRIBE.

Cisti, *Jussieu*. Cistöideæ, *Ventenat*. Cistineæ. *De Candolle*.

The substance called Ladanum is a resinous exudation from the *Cistus creticus*, growing, as its name implies, in Crete. In the time of Dioscorides it was collected by combing the beards of the goats which browse on the plant. According to Tournefort (*Voyage into the Levant*, i. p. 79, 1741,) and Sieber, it is now collected by a kind of whip or rake, with a double row of leathern thongs. With this the countrymen brush the plants, and when the whips are sufficiently laden with the juice, it is scraped off by knives, and made into cakes. Pure ladanum consists of *resin* and *volatile oil* 86, *wax* 7, *aqueous extract* 1, and *earthy matters and hairs* 6 (Guibourt). Pelletier found 72 per cent. of sand in it. It possesses stimulant properties, and was formerly a constituent of some plasters. Its use is now obsolete.

Fig. 245.

Cistus creticus.

Fig. 246.

Ladanum Whip.

Order LXXX.—CRUCIFEREÆ, *Jussieu*.—THE CABBAGE OR CRUCIFEROUS TRIBE.

Brassicaceæ, *Lindley*.

Essential Character.—*Sepals* four, deciduous cruciate. *Petals* four, cruciate, alternate with the sepals. *Stamens* six, of which two are shorter, solitary, opposite the lateral sepals, and occasionally toothed; and four larger, in pairs, opposite the anterior and posterior sepals, generally distinct, sometimes connate, or furnished with a tooth on the inside. *Disk* with various green glands between the petals and the stamens and ovary. *Ovary* superior, unilocular, with parietal placentæ usually meeting in the middle, and forming a spurious dissepiment. *Stigmas* two, opposite the placentæ. *Fruit* a silique or silicule, one-celled, or spuriously two-celled; one or many-seeded; dehiscing by two valves separating from the replum; or indehiscent. *Seeds* attached in a single row by a funiculus to each side of the placentæ, generally pendulous. *Albumen* none. *Embryo* with the radicle folded upon the cotyledons.—*Herbaceous* plants, annual, biennial, perennial, very seldom suffruticose. *Leaves* alternate. *Flowers* usually yellow or white, seldom purple (*Lindley*).

Fig. 247.

A Silique.

Properties.—Pungent stimuli. They furnish nutritive condimentary and antiscorbutic substances. Their pungency depends on an acrid volatile oil, composed of *carbon*, *nitrogen*, *hydrogen*, *sulphur*, and *oxygen*. This oil becomes absorbed, and in some cases is detectable in the secretions. The nutritive properties of cruciferæ arise from their mucilaginous, saccharine, and extractive constituents. *Cakile maritima* is purgative. *Cheiranthus lividus* is said to be dangerous to goats; while *Lepidum piscidium* we are told stupefies fish. These statements, however, require further proof. With these doubtful exceptions none of the cruciferæ are poisonous.

1. CARDAMINE PRATENSIS, *Linn.* L. D.—CUCKOO-FLOWER.

Sex. Syst. Tetradynamia, Siliquosa.

(Flores, *L. D.*)

History.—Brunfels and Tragus are the earliest writers in whose works an undoubted notice of this plant appears. (Sprengel *Hist. Rei Herb.*)

Botany. **Gen. Char.**—*Silique* linear, with flat, nerveless valves, which often separate elastically. *Seeds* ovate, not bordered (O=). *Umbilical cords* slender (De Cand.)

Sp. Char.—*Leaves* pinnatisect; segments of the radical ones somewhat

rounded—of the cauline ones, linear or lanceolate, entire. *Style* very short, scarcely more slender than the silique; *Stigma* capitate (De Cand.)

Root perennial. *Stem* about a foot high. *Flowers* light purple, flesh-coloured, or white.

Hab.—Indigenous; meadows and moist pastures. Flowers in April and May.

Description.—The flowers (*flores cardamines*) are somewhat bitter and pungent, and have a slight odour. By drying they become inodorous and almost insipid. The *leaves* possess a flavour analogous to, though less agreeable than, the common water-cress.

Composition.—I am unacquainted with any analysis of the plant worth quoting. The pungency depends on *volatile oil*, the bitterness on *extractive matter*. A few experiments on this plant are mentioned by Gronhert. (*Spec. Inaug.* Resiomonti, 1785.)

Physiological Effects and Uses.—The flowers of cardamine are said to be stimulant, diaphoretic, diuretic, and nervine. They were formerly used in epilepsy, especially when it occurred in children, but have now fallen into almost total disuse. They were recommended by Sir George Baker (*Med. Trans.* i. 442,) in cholera and spasmodic asthma.—Dose of the dried flowers, 3ij. or 3iij.

2. COCHLEA'RIA ARMORA'CIA, *Linn. L. E. D.*—HORSE-RADISH.

Sex. Syst. Tetradynamia, Siliculosa.

(Radix recens, *L.*—Fresh root, *E.*—Radix, *D.*)

(Armoracia, U. S.)

History.—Sprengel (*Hist. Rei Herb.* i. 182,) considers this plant to be the ῥαφανὶς ἀγρία of Dioscorides, (lib. ii. 138); and Dierbach (*Arzneim. d. Hippok.* 125,) suggests that it was known to Hippocrates. But these opinions are by no means well established.

Botany. **Gen. Char.**—*Silicule* sessile, ovate-globose or oblong, with ventricose valves. *Seeds* many, not bordered. *Calyx* equal, spreading. *Petals* entire. *Stamens* not toothed.—(O =). *Flowers* white. *Leaves* often somewhat fleshy. (De Cand.)

Sp. Char.—*Silicules* ellipsoid. Radical *leaves* oblong, crenate; cauline ones elongated, lanceolate, dentate, or incised. *Root* fleshy, large. (De Cand.)

Root perennial, long, cylindrical, white, very pungent. *Stems* two feet high. *Leaves* much veined. *Flowers* white.

Hab.—Indigenous; extensively cultivated. Flowers in May.

Description.—Horse-radish root (*radix armoraciæ; radix raphani rusticani*) evolves, when scraped into shreds, a highly penetrating, acrid vapour. Its taste is very pungent. It is coloured blue by tincture of iodine. An infusion of it is tinged reddish-yellow by the sesquisalts of iron.

Composition.—Horse-radish root was analyzed by Gutret, (Gmelin, *Handb. d. Chem.* ii. 1248,) who found its constituents to be—*acrid volatile oil*, *bitter resin*, *extractive*, *sugar*, *gum*, *starch*, *woody fibre*, *vegetable albumen*, *acetic acid*, and *acetate* and *sulphate of lime*.

Volatile Oil (*Oleum Armoraciæ.*)—Obtained by distillation without water. It is pale yellow, heavier than water, and very volatile. Its odour is exceedingly powerful, and like that of horse-radish. One drop is sufficient to infect a whole room. Its taste is at first sweetish, then burning and acrid. It causes inflammation and vesication when applied to the skin. It is slightly soluble in water, easily so in alcohol. The watery solution yields, with acetate of lead, a brown precipitate (*sulphuret of lead*); with nitrate of silver, a black one (*sulphuret of silver*).

Physiological Effects.—Horse-radish is a well-known pungent, acrid stimulant, capable of producing vesication when applied to the skin, and of causing vomiting, when taken, in the form of infusion, into the stomach. Its odorous

emanations readily excite a copious flow of tears. On the general system it operates as a stimulant, and promotes both urine and perspiration.

Uses.—Scraped in shreds, it is used at the table as a condimentary accompaniment to roast beef. It is not much employed as a medicine. Chewed, it serves as an excellent masticatory. Taken in this way, or in the form of syrup, it may be serviceable in some forms of hoarseness. An infusion of it may be taken to excite vomiting, or to promote the operation of other emetics, as in poisoning by narcotic substances. As a general stimulant, diaphoretic, and diuretic, it has been used in palsy, chronic rheumatism, and dropsy. It is one of the remedies deemed antiscorbutic.

Administration.—Dose, ʒss. or more, scraped into shreds.

1. INFUSUM ARMORACIÆ COMPOSITUM, L. D. *Compound Infusion of Horse-radish.*—(Horse-radish, sliced; Mustard-seeds, bruised, of each, ʒj.; Compound Spirit of Horse-radish, fʒj.; Boiling [distilled, *L.*] Water, Oj. Macerate the root and seeds in the water for two [six, *D.*] hours, in a lightly covered vessel, and strain. Then add the compound Spirit of Horse-radish.)—This preparation soon undergoes decomposition. It is stimulant and diuretic, and has been employed in chronic rheumatism, paralysis, dropsies, and scurvy.—Dose, fʒj. to fʒij.

[2. INFUSUM ARMORACIÆ, (U. S.) Take of Horse-radish, sliced, Mustard, bruised, each, an ounce; Boiling Water, a pint. Macerate for two hours in a covered vessel, and strain. The uses are the same as the preceding.—Dose, fʒj. to fʒij.]

3. SPIRITUS ARMORACIÆ COMPOSITUS, L. D. *Compound Spirit of Horse-radish.*—(Horse-radish, sliced; Dried Orange Peel, of each ʒxx.; Nutmegs, bruised, ʒv.; Proof Spirit, *Cong.* i.; Water, Oij. Mix [macerate for twenty-four hours, *D.*], and let a gallon distil. The proportions of ingredients used by the Dublin College are not essentially different from those of the London College.)—Usually employed as a stimulating adjunct to other medicines, especially to diuretic infusions. Dose, fʒj. to fʒiv.

3. COCHLEA'RIA OFFICINA'LIS, *Linn. D.*—COMMON SCURVY-GRASS.

Sex. Syst. Tetradynamia, Siliculosa.

(Herba, *D.*)

History.—This plant does not appear to have been known to the ancients.

Botany. **Gen. Char.**—See *Cochlearia Armoracia.*

Sp. Char.—*Silicules* ovate-globose, twice as short as their pedicels. Radical *leaves* stalked, cordate; cauline ones ovate dentate-angular. (De Cand.)—*Annual. Stem* about a foot high. *Flowers* pure white.

Hab.—Indigenous; on the sea-coast, and in watering places on the Welsh and Scottish mountains. Cultivated in gardens.—Flowers in April and May.

Description.—Scurvy-grass (*herba cochleariæ*) evolves, when rubbed, a somewhat pungent odour. Its taste is penetrating and acrid.

Composition.—The *inspissated juice* was examined by Braconnot, (*Journ. Phys.* lxxxiv. 278,) and the *fresh herb* by Gutret. (Gmelin, *Handb. d. Chem.* ii. 1248.) The latter obtained the following constituents:—*volatile oil, bitter resin, bitter extractive, gum, green fecula, vegetable albumen, hydrochlorate* and *sulphate of ammonia, nitrate* and *sulphate of lime.*

Volatile Oil (*Oleum Cochleariæ*).—This is yellow, heavier than water, very volatile, and soluble in alcohol. Its odour is strong, and its taste acrid.

Physiological Effects and Uses.—A gentle stimulant, aperient, and diuretic. It has long been esteemed as an antiscorbutic. (See Valentinus, *Cochlearia curiosa*, by Shirley, 1676.) It has also been used in visceral obstructions. It is occasionally eaten with bread and butter, like the water-cress.

4. SINA'PIS NI'GRA, *Linn.* L. E. D.—COMMON OR BLACK MUSTARD.

Sex. Syst. Tetradynamia, Siliquosa.

(Semina, *L.*—Flour of the seeds, generally mixed with those of Sinapis alba, and deprived of fixed oil by expression, *E.*—Seminum pulvis, *D.*)

(Sinapis, U. S.)

HISTORY.—Mustard (νάπυ) was employed in medicine by Hippocrates.

BOTANY. **Gen. Char.**—*Silique* somewhat terete; the valves nerved. *Style* small, short, acute. *Seeds* in one row, somewhat globose. *Calyx* spreading De Cand.)

Sp. Char.—*Siliques* smooth, even, somewhat tetragonal, pressed close to the peduncle. Lower *leaves* lyrate; upper ones lanceolate, quite entire, stalked.—*Annual*. *Stem* three or four feet high. *Flowers* yellow.

Hab.—Indigenous; hedges and waste places. Cultivated in fields, especially in Durham and Yorkshire.

DESCRIPTION.—Black mustard seeds (*semina sinapis nigræ*) are small and roundish. Externally they are beautifully veined, and of a reddish or blackish brown colour, though sometimes whitish. Internally they are yellow. They are inodorous, but have an acrid bitter oleaginous taste.

MANUFACTURE OF MUSTARD.—The following method of preparing *flour of mustard* (*farina sinapis*) was kindly furnished me by a manufacturer:—The seeds of both black and white mustard are first crushed between rollers, and then pounded in mortars. The pounded seeds are then sifted. The residue in the sieve is called *dressings* or *siftings*: what passes through is *impure flour of mustard*. The latter by a second sifting yields *pure flour of mustard*, and a second quantity of dressings. The *common flour of mustard* of the shops is adulterated with flour (wheaten), coloured by turmeric, and rendered hot by pod pepper. By pressure the dressings or siftings yield a fixed oil (*fixed oil of mustard*), which is used for mixing with rape and other oils. The whole seeds are never pressed. Mustard cake is employed as a manure, being too hot for cattle.

COMPOSITION.—Black mustard seed was analysed by Thibierge, (*Journ. de Pharm.* tom. v. p. 349.) Some of its constituents have subsequently been examined by Henry fils and Garot (*Journ. de Chim. Méd.* i. 439 and 467; and *Journ. de Pharm.* xvii. 1); by Pelouze (*Journ. de Chim. Méd.* vi. 577); by Robiquet and Boutron (*Journ. de Pharm.* xvii. 290); by Fauré (*ibid.*); by Simon (*ibid.* xxv. 366); by Bussy (*ibid.* xxvi. 39); and by Bouton and Frémy. (*Ibid.* p. 48.) From their labours we learn that black mustard seed contains *myronate of potash*, *myrosyne*, *fixed oil*, *a pearly fatty matter*, *gummy matter*, *sugar*, *colouring matter*, *sinapisin*, *free acid*, *peculiar green matter*, and some *salts*.

1. MYRONIC ACID.—So called by Bussy, its discoverer, from μυρον, *an odorous oil*. It is an inodorous, non-volatile, bitter, non-crystallizable acid. It is soluble in water and alcohol, but not in ether. It is composed of *carbon*, *sulphur*, *hydogen*, *nitrogen*, and *oxygen*. The alkaline myronates are crystallizable. Myronate of potash yields no precipitate with nitrate of silver, nitrate of baryta, acetate of lead, bichloride of mercury, or chloride of calcium. The characteristic property of myronic acid is, to yield the *volatile oil of mustard* when mixed with a solution of myrosyne.

2. MYROSYNE; *Emulsin of black mustard*.—Bussy called it myrosyne, from μυρον, *odorous oil*, and συν *with*, because it yields, with myronic acid, the volatile oil of mustard. It has considerable resemblance to vegetable albumen and emulsin, but as it cannot be replaced by either of these substances, in the developement of the volatile oil, it must be regarded as a substance *sui generis*. It is soluble in water; but is coagulated by heat, alcohol, and acids, and in this state it loses the power of acting on the myronates, and of yielding the volatile oil.

3. SINAPISIN.—This term has been given, by Simon, to a substance which he procured from black mustard seeds, and which he states possesses the following properties:—It presents itself in the form of white, brilliant, micaceous, volatile crystals, which are soluble in alcohol, ether, and the oils, but are insoluble in acids and alkalis. When mixed with the albumen of the mustard-seed, it yields the volatile oil of mustard. Bussy ascribes this last property to myronic acid. It is highly improbable that two constituents of mustard should possess it. Analogy

would lead us to suppose that the oil is generated by non-acid substances. Simon says sinapisin contains no sulphur.

4. Volatile Oil of Mustard.—This does not pre-exist in the seeds; but is formed when water is added to the farina, by the mutual action of the contained myrosyne and myronate of potash (sinapisin ?); just as the volatile oil of bitter almonds is generated by the mutual action of emulsin, amygdalin, and water (see p. 527). Alcohol extracts from the farina no volatile oil; but by coagulating the myrosyne, renders the farina incapable of developing the oil by the subsequent action of water. Sulphuric acid and the other mineral acids, as well also as carbonate of potash, check the formation of the oil. But when the oil is once formed, the acids have no power to prevent its effects. Volatile oil of mustard is colourless or pale yellow; it has a most penetrating odour, and a most acrid burning taste. Its sp. gr. at 68° F. is 1·015. It boils at 290° F. It is slightly soluble in water, but readily so in alcohol and ether. By the action of ammonia on this oil, an odourless, crystallizable substance (an *amide* ?) is produced, which consists of one atom of the oil and two atoms of ammonia. (Dumas and Pelouze, *Journ. de Chim. Méd.* ix. 645.) These crystals are decomposed with the greatest facility by binoxide of mercury. (Robiquet and Bussy, *Journ. de Pharm.* xxvi. 119.) Volatile oil of mustard consists of *carbon* 49·84, *hydrogen* 5·09, *nitrogen* 14·41, *oxygen* 10·18, and *sulphur* 20·48; or C^{32} H^{20} N^4 O^5 S^3. It is powerfully acrid, rubefacient, and vesicant. It has been proposed as a rubefacient in paralysis and as a vesicant. The *distilled water of mustard* has been employed against the itch. (Julia Fontenelle, *Journ. de Chim. Méd.* i. 131.)

5. Fixed Oil of Mustard.—Usually procured from the dressings or siftings of mustard, above referred to. It constitutes about 28 per cent. of the seeds. Its colour is reddish or brownish yellow: it has a faint odour of mustard, and a mild oily taste. It does not readily become rancid. It has been used as an anthelmintic. (Fontenelle, *op. supra. cit.* 131.)

Physiological Effects.—Mustard is an acrid stimulant belonging to the group of the *volatile pungent stimuli* (see vol. i. p. 183). It holds an intermediate rank between horseradish and pepper. Its topical action is that of a powerful acrid, and depends on the volatile oil developed by the action of water. The irritant operation, on the eyes, of the vapour arising from a mixture of hot water and flour of mustard, is familiarly known. Mustard cataplasms cause redness and burning pain, which, if the application be continued, becomes almost insupportable. A prolonged application causes vesication, with even ulceration and gangrene. Compared with those of cantharides, the topical effects of mustard on the skin sooner subside when the application is discontinued. When swallowed, mustard evinces the same stimulant operation on the stomach and bowels. Taken *in moderate quantities*, with the food, it promotes the appetite, and assists the assimilation of substances which are difficult of digestion. *In somewhat larger doses* (as one or two teaspoonsful) it rouses the gastric susceptibility, and operates as an emetic. *In excessive quantities* it gives rise to vomiting, purging, and gastro-enteritis. The effects of mustard on the general system are those of a stimulant. It quickens the pulse, and promotes the secretions (especially the urine) and the exhalations.

Uses.—The *dietetical* uses of mustard are well known. It is well adapted for cold, phlegmatic individuals, with a torpid or atonic condition of the digestive organs. It is an excellent condimentary adjunct to heavy and difficultly digestible foods, as fatty matters.

As a *medicinal* agent, mustard is employed for several purposes. As an *emetic* it is useful where we want to rouse the gastric sensibility, as in narcotic poisoning, malignant cholera, and some forms of paralysis. (On the use of mustard emetics in cholera, see *Lond. Med. Gaz.* vol. ix. pp. 519, 592, and 795.)

As a stimulant to the digestive organs it is applicable in atonic or torpid conditions of these parts, with dyspepsia, loss of appetite, and hepatic torpor. *As a diuretic* it has been employed with some benefit in dropsy. (Mead, *Works*, p. 514, 1762.) As a *febrifuge* in intermittents, it has been employed either alone or in conjunction with cinchona. (Bergius, *Mat. Med.* ii. 618, 2d ed.) But the principal use of mustard is as a *rubefacient* (see *Cataplasma Sinapis.*) Flour of mustard is sometimes added to pediluvia.

Administration.—As an *emetic* the dose is from a teaspoonful to a tablespoonful of the flour of mustard in a tumblerful of water. As a *diuretic* in dropsies, and for some other purposes, *mustard whey* (*serum lactis sinapinum*)

is a convenient form of exhibition. It is prepared by boiling half an ounce of the bruised seeds or powder in a pint of milk, and straining: the dose is ʃ℥iv. twice or thrice a day.

CATAPLASMA SINAPIS, L. D.; *Sinapismus. Mustard Poultice* or *Sinapism.*—(Linseed; Mustard-seed, of each, powdered, lb. ss.; Boiling Vinegar as much as may be sufficient to make them of the consistence of a cataplasm [which may be made more stimulating by adding ℥ij. of the scrapings of horseradish root, *D.*])—Crumb of bread may be often conveniently substituted for linseed meal. Vinegar and other acids check the formation of the acrid oil. Boiling water also has an injurious effect. Hence water, whose temperature does not exceed 100° F., is to be preferred for making the mustard poultice. Aetius (*Sermo* iii. cap. 181) was acquainted with the injurious influence exercised by vinegar on mustard; and he observes,—"*Sed et hoc noscendum est: si in aceto maceretur sinapi inefficatus redditur: Acetum enim sinapis vim discutit.*" Several experiments on this subject have been made by Trousseau and Pidoux. (*Traité de Thérap.* i. 692.) They found that a sinapism made with flour of black mustard and water produced as much effect in six minutes as one made with the flour of black mustard and vinegar did in fifty. Curiously enough, however, they state that vinegar did not diminish the activity of English flour of mustard. This, perhaps, is referrible to the fact that common English flour of mustard contains pod pepper, the active principle (*capsicin*) of which is soluble in vinegar (see p. 324).—The mustard cataplasm is a powerful local irritant. It readily excites inflammation, and, when allowed to remain applied sufficiently long, causes vesication. It proves, in many cases, a most painful application. In various affections of the brain (as in the stupor and delirium of low fever, in apoplexy, and in poisoning by opium) it is a most valuable application to the feet and ankles. In pulmonary and cardiac diseases it is occasionally applied to the chest with excellent effects. Dr. Blackall (*Observ. on Dropsies*, p. 339, 4th ed. 1824) speaks in high terms of the mustard cataplasm, quickened with oil of turpentine, in typhoid pneumonia. Of course, in all these cases, it operates on the principle of a blister, over which its speedy effect gives it a great advantage. It is applied spread on linen or calico. Great caution is necessary in its application to persons who are insensible to pain; for if it be continued too long it may occasion ulceration and sloughing, though no pain be manifested. Hence its effects should be examined at short intervals. In one case death had nearly resulted from the neglect of this caution. Four sinapisms were applied to the wrists and insteps of a female lying in a comatose condition following puerperal convulsions. As no manifestation of pain occurred, the application was continued for three hours. Sloughing followed, which had nearly proved fatal. (Trousseau and Pidoux, *op. supra cit.* i. 700.)

5. SINAPIS AL'BA, *Linn. E. D.*—WHITE MUSTARD.

Sex. Syst. Tetradynamia, Siliquosa.

(Semina, *D.*—Flour of the seeds of Sinapis nigra, generally mixed with those of Sinapis alba, and deprived of fixed oil by expression, *E.*)

(Sinapis, U. S.)

BOTANY. **Gen. Char.**—See *Sinapis nigra.*

Sp. Char.—*Siliques* hispid, spreading, somewhat narrower than the ensiform beak. *Leaves* lyrate, and, as well as the *stem*, nearly smooth. (De Cand.)

Annual. Stem one or one and a half foot high. *Flowers* large, yellow. *Beak* longer than the pod.

Hab.—Indigenous; in waste places. Cultivated in both fields and gardens. Flowers in June.

DESCRIPTION.—White mustard seeds (*semina sinapis albæ*) are larger and somewhat less acrid to the taste than the black ones. They consist of rounded-

elliptical yellow grains, composed of a yellow nucleus enveloped in a thin semi-transparent shell. The hilum is at one extremity of the ellipse.

Composition.—According to the analysis of John (Gmelin *Handb. d. Chem.* ii. 1247,) white mustard seeds consist of an *acrid volatile oil*, *yellow fatty oil*, *brown mild resin*, *extractive* (very small quantity), *gum* (small quantity), *woody fibre*, *albumen*, *free phosphoric acid*, and *salts*.

Robiquet and Boutron, (*Journ. de Pharm.* xvii. p. 279,) however, have proved that white mustard contains neither volatile oil nor any substance capable of producing it; but owes its activity to *a non-volatile acrid substance* which does not pre-exist in the seeds, but is readily formed in them under certain conditions. Another chemical peculiarity of white mustard seed is, that it contains *sulphosinapisin*. (Henry and Garot, *Journ. de Chim. Méd.* i. 441.) Hence, while sesquichloride of iron strikes a deep red colour in an infusion of white mustard, it merely communicates an orange tint to the infusion of black mustard. Moreover, the thick mucilaginous liquor obtained by digesting the seeds of white mustard in cold water is peculiar to them. (Cadet, *Journ. de. Pharm.* xiii. 191.) Simon (*Journ. de. Pharm.* xxv. 370,) has announced the existence of a new principle, which he calls *erucin*.

1. Sulphosinipisin.—It was at first supposed to be an acid, and was in consequence called, by Henry and Garot (*Journ. de Chim. Méd.* i. 439,) *sulphosinapic acid*. But they subsequently established its non-acid properties. It is a white, crystallizable, odourless, bitter substance, soluble in water, alcohol, and ether. Under the influence of various agents (acids, oxides, and salts) it readily yields hydrosulphocyanic acid. To this acid is probably to be ascribed the red colour developed when a persalt of iron is added to an aqueous infusion of black mustard. Its aqueous solution forms, with nitrate of silver, a white precipitate. Boutron and Fremy state that sinapisin [sulphosinapisin] under the influence of emulsin, is converted into an acrid substance and hydrosulphocyanic acid. Sulphosinapisin consists of *carbon* 57·920, *hydrogen* 7·795, *nitrogen* 4·940, *sulphur* 9·657, and *oxygen* 19·688; or C^{24} H^{22} N S^2 O^7.

2. Non-volatile acrid principle.—This does not pre-exist in white mustard, but is readily developed in it by cold water. As before mentioned, Boutron and Fremy (*Journ. de Pharm.* xxvi. 50,) ascribe its formation to the action of the emulsin of the seed on the sulphosinapisin, by which hydrosulphocyanic acid and this acrid matter are produced. The latter substance is an unctuous, reddish, odourless liquid, which has the pungent hot taste of the horse-radish. It contains sulphur as one of its constituents.

3. Erucin.—A yellowish white substance, which is very soluble in ether, carburet of sulphur, and turpentine. It dissolves in boiling alcohol, but is insoluble in water and solution of ammonia. It does not redden the salts of iron, and contains no sulphur.

Physiological Effects.—Similar to, though milder than, those produced by black mustard. Swallowed whole, the seeds prove stomachic, laxative, and diuretic. But their use, in the large quantities in which they have been recommended, is by no means free from danger. Gastro-enteritic inflammation of a fatal kind has been induced by them. The danger of their accumulation in the appendix cæci is obvious. Mr. J. L. Wheeler (*Cat. Rat. Plant. Méd.* Lond. 1830,) has known them retained in the bowels for seven weeks.

Uses.—Dr. Cullen (*Mat. Med.* ii. 171,) first mentions the practice of giving half an ounce, or an ordinary table-spoonful, of entire unbruised mustard-seeds. A few years ago it was again brought forward, as if new. (C. T. Cooke, *Obs. on the Efficacy of White Mustard-seed*, 3d. ed. 1826.) It has been advocated in a long list of diseases attended with torpor or atony of the digestive organs; and at one time it was fashionable and popular. Sir John Sinclair (*Lancet*, Jan. 25th, 1834, p. 669,) recommended mustard seeds for the preservation of the health of old people especially. The seed-leaves of white mustard and of *Lepidium sativum* are used at table under the name of *mustard and cress* or *corn salad*.

Administration.—From two to three large tea-spoonfuls to a table-spoonful of the whole unbruised seed have been recommended to be swallowed three or four times daily.

Order LXXXI.—PAPAVERACEÆ, *Jussieu*.—THE POPPY TRIBE.

Essential Character.—*Sepals* two, deciduous. *Petals* hypogynous, either four or some multiple of that number, placed in a cruciate manner. *Stamens* hypogynous, either eight, or some multiple of four, generally very numerous, often in four parcels, one of which adheres to the base of each petal; *anthers* two-celled, innate. *Ovary* solitary; *style* short or none, *stigmas* alternate with the placentæ, two or many; in the latter case stellate upon the flat apex of the ovary. *Fruit* one-celled, either pod-shaped, with two parietal placentæ, or capsular, with several placentæ. *Seeds* numerous; *albumen* between fleshy and oily; *embryo* minute, straight at the base of the albumen, with plano-convex *cotyledons*.—*Herbaceous* plants or *shrubs*, with a milky juice. *Leaves* alternate, more or less divided. *Peduncles* long, one-flowered; *flowers* never blue (*Lindley*).

Properties.—The plants of this order possess narcotic and acrid properties. At the head of the narcotic papaveraceæ stands the genus *Papaver*, from which opium is procured. The acrid papaveraceæ usually possess narcotic properties also. *Sanguinaria canadensis* is one of the best known acro-narcotics of this order. (Bird, *An Inaug. Dissert. on Sang. canad.* New York, 1822.) In doses of from ten to twenty grains it operates as an emetic. In larger doses it causes depression of pulse, faintness, dimness of vision, and alarming prostration of strength. Its active principle is an alkali called *sanguinarina*. *Chelidonium majus* is another acrid of this order.

1. PAPA'VER RHŒ'AS, *Linn. L. E. D.*—COMMON RED OR CORN POPPY.

Sex. Syst. Polyandria, Monogynia.

(Petala, *L. D.*—Petals, *E.*)

History.—Theophrastus (*Hist. Plant.* ix. 13,) calls the red poppy ῥοιὰς. Dr. Sibthorp (*Prod. Fl. Græc.* i. 359,) considers the μήκων ῥοιὰς of Dioscorides (lib. iv. cap. 64,) to be the red poppy.

Botany. **Gen. Char.**—*Sepals* two, convex, deciduous. *Petals* four. *Stamens* numerous. *Style* none. *Stigmas* four to twenty, radiating, sessile upon the disk crowning the ovary. *Capsule* obovate, one-celled, composed of from four to twenty carpels inclosed in a membranous production of the thalamus, dehiscing by short valves under the crown of the stigma. *Placentæ* between the valves, produced internally, forming complete dissepiments (De Cand.)—*Herbs* with a white juice. *Peduncles* inflexed at the apex before flowering.

Sp. Char.—*Capsule* smooth, obovate. *Sepals* hairy. *Stem* many-flowered, rough, with spreading setæ. *Leaves* pinnatipartite; lobes elongated, incised-dentate, acute (De Cand.)

Annual. *Petals* rich scarlet. This plant is distinguished from Papaver dubium by, 1st, the wide spreading hairs of the flower-stalks: 2dly, a shorter capsule; 3dly, its stigma of eight to ten rays.

Hab.—Indigenous. A troublesome weed common in fields. Flowers in June or July.

Description.—The petals of the red poppy (*petala rhœados* seu *papaveris erratici*) have a rich scarlet colour, a slightly opiate odour, and a bitterish taste. By drying they become violet red and odourless.

Composition.—The flowers of the red poppy have been analysed by Beetz and Ludewig, (Gmelin, *Handb. d. Chem.* ii. 1246,) and by Riffard. (*Journ. d. Pharm.* xii. 412.) The latter chemist obtained *yellow fatty matter* 12, *red-coloured matter* 40, *gum* 20, *lignin* 28. It is not improbable that this plant may contain *morphia* in very minute quantity.

Red Colouring Matter.—Riffard obtained it, in the impure state, by first macerating the petals in ether to remove a fatty matter, and then in alcohol. By distilling the alcoholic tincture to dryness, a dark-red colouring matter was obtained, which in thin layers was bright red. It was deliquescent in the air, soluble in alcohol and in water, but insoluble in ether. Acids diminished the intensity of its colour. Chlorine decolorized it. The alkalis blackened it. By the last character it is distinguished from the colouring matter of the red cabbage, &c., which becomes green by alkalis. Sesquichloride of iron gives it a dark violet or brown tinge.

Physiological Effects and Uses.—The red poppy is valued medicinally as a colouring ingredient only. It probably possesses a narcotic property in a very slight degree, but which is scarcely sensible in the ordinary doses in which

this medicine is employed. Navier (Wibmer, *Wirk. d. Arzneim. u. Gifte*, Bd. iv. S. 47,) says that the continued use of the tincture or syrup by dogs, gave the stomach a bluish red tinge.

SYRUPUS RHŒADOS, L. E. D. *Syrup of Red Poppies; Syrup of Corn Poppy.*—(Petals of the Red Poppy, lb. j.: Boiling Water, Oj.; Pure Sugar, lb. ijss. [lb. iij. *D.*] Add the petals of the red poppy gradually to the water heated in a water-bath [vapour-bath, *E.*], frequently stirring them; then, the vessels being removed, macerate for twelve hours; afterwards [strain and, *E.*] express the liquor [through calico, *E.*], and [after the dregs have subsided, *L.*] add the sugar and dissolve [with the aid of heat, *E.*])—Employed only as a colouring ingredient, especially in conjunction with acids, which brighten it. It readily ferments and spoils.

2. PAPA'VER SOMNIF'ERUM, *Linn. L. E. D.*—THE SOMNIFEROUS OR WHITE POPPY.

Sex. Syst. Polyandria, Monogynia.

(Capsulæ maturæ. Capsulæ immaturæ Succus concretus, *L.*—Capsules not quite ripe. Concrete juice from the unripe capsules, *E.*—Capsularum succus proprius concretus. Capsulæ maturæ, *D.*)

(Papaver, U. S. Poppy Heads.—Opium, U. S.)

History.—This is one of the most anciently known and described plants. Homer speaks of the *poppy* (μήκων) growing in gardens (*Il.* viii. 306); so that it appears to have been in cultivation even in that early period. It was employed in medicine by Hippocrates, and is mentioned by Theophrastus, Dioscorides, and Pliny. Hippocrates (*De vict. rat.* lib. ii. p. 357, ed. Fœs,) speaks of two kinds—the *black* and *white poppy*: the former, he says, confines the bowels more than the latter.

It is uncertain at what period *opium* was first known or introduced into medicine. Hippocrates (*De Morb. Mul.* lib. ii. p. 670,) recommends the μηκώνιον, or *poppy juice*, in a disease of the uterus; and Dioscorides (lib. iv. cap. 65,) on the authority of Erasistratus, tells us that Diagoras (who was contemporary, it is supposed, with Hippocrates) condemned the use of opium. These are, I believe, the most ancient Greek authorities who speak of this substance; and it is impossible, I think, to arrive at any accurate conclusion from their remarks, whether opium had or had not been known long before their time, though Alston (*Lect. on the Mat. Med.* ii. 456,) infers, from the little use made of it by Hippocrates, as well as from Diagoras condemning its use in diseases of the eyes, that its virtues were not known long before him. Dioscorides and Pliny (*Hist. Nat.* lib. xx. cap. 76, ed. Valp.) mention that the expressed juice of the heads and leaves is termed *Meconium*, and that it is much weaker than opium. Theodore Zwinger, Sprengel, (*Hist. Rei Herb.* i. 25,) and others, have supposed that the *nepenthes* (νηπενθές) of Homer (*Od.* iv. 220,) was opium. Dr. Royle, (*Illustr.* p. 334,) however, has suggested that the substance referred to by Homer may have been a preparation of *Cannabis sativa* (see p. 202), the remarkable effects of which have been recently pointed out by Dr. O'Shaughnessy. (*On the Prepar. of the Indian Hemp*, Calcutta, 1839.)

The word *opium* is derived from ὀπὸς, *the juice*, and signifies that it is *the juice* par excellence;—just as the flower of the rosemary has been called *anthos*, or *the flower*,—and the cortex cinchonæ, *the bark*.

Botany. **Gen. Char.**—See *Papaver Rhœas*.

Sp. Char.—*Capsules* obvovate or globose, and, as well as the *calyces*, smooth. *Stem* smooth, glaucous. *Leaves* amplexicaul, cut-repand, dentate, somewhat obtuse (De Cand.)

An annual *herb*. *Root* white, tapering. *Stem* two to six feet high, erect, branched, leafy, glaucous green. *Leaves* alternate, sessile, ovate-oblong, glaucous beneath. *Peduncles* terminal, leafless, with bristly hairs. *Seeds* numerous, small, roundish or reniform, oily, sweet, and edible.

There are two well-marked varieties, which, by some botanists, are considered to be distinct species:—

α. nigrum. P. somniferum, Gmelin.—*Capsules* globose, opening by foramina under the stigma. *Seeds* black. *Peduncles* many. *Flowers* usually violet or red, of different tints, though sometimes white.

β. album. P. officinale, Gmelin.—*Capsules* ovate-globose; foramina under the stigma either none or obliterated. *Peduncles* solitary. *Seeds* and *petals* white.

Hab.—Asia and Egypt. Grows apparently wild in some parts of England, but has probably escaped from gardens. Cultivated in Hindostan, Persia, Asia Minor, and Egypt, on account of the opium obtained from it. According to Dr. Royle, var. *β. album* is cultivated in the plains of India; and var. *α. nigrum* in the Himalayas. In Europe the poppy is cultivated for the capsules, either as medicinal agents or for the oil (*poppy oil*) obtained from the seeds, and which is employed in painting. The London market is principally supplied with poppy heads from the neighbourhood of Mitcham, in Surrey.

Description. 1. Of Poppy Heads.—Poppy heads (*Capsulæ* seu *Capita Papaveris*) are usually collected when quite ripe, as ordered by the London and Dublin Colleges, but they would be more active as medicinal agents if they were gathered while still green; and the Edinburgh College very properly directs the immature capsule to be employed. As met with in commerce, poppy heads vary somewhat in size, from that of a hen's egg to that of the fist. Their texture is papyraceous: on the top of them is the star-like stigma. They are yellowish or yellowish brown, and, if they have been collected before they were quite ripe, have a bitterish taste. When fresh, they have a slightly opiate odour, which they lose by drying. A decoction of the dried poppy capsule is rendered, by the sesquichloride of iron, brownish red (*meconate of iron*). Nitric acid makes it transparent, and communicates a slightly orange-red tinge, indicative of the presence of morphia.

2. Opium. *α.* Preparation.—The mode of extracting opium is, to a certain extent, similar in all countries, and consists in making incisions into the half-ripe poppy capsules, and collecting the exuded juice. According to Dioscorides, (lib. iv. cap. 64,) Kæmpfer, (*Amæn. Exot.* p. 643,) Kerr, (*Med. Observ. and Inq.* vol. v. p. 317,) and Texier, this juice is worked up into a homogeneous mass: whereas Bellonius (*Observ.* lib. iii. cap. 15,) and Olivier (*Voy. dans l'Empire Ottoman,*) speak of the juice concreting on the poppy; and the first of these writers describes opium as consisting of agglomerated granules. Now Guibourt, (*Hist. abrèg.* ii. 3me éd. 1836,) by examining the opiums of commerce by means of a magnifier, thinks he has discovered that the Smyrna and Persian (or Trebizon) opium is composed of small agglutinated tears (*opium with a grain*); whereas the Egyptian, and I would add the Indian, opium, is a homogeneous mass, and therefore must have been worked up in the manner described by Dioscorides, Kæmpfer, and others (*homogeneous opium*). One of the latest accounts of the method of obtaining opium is that given by M. Ch. Texier (*Journ. de Pharm.* xxi. 196,) of the process followed in Asia Minor:—"A few days after the flower has fallen, men and women repair to the fields and cut the head of the poppy horizontally, taking care that the incisions do not penetrate the internal cavity of the shell. A white substance immediately flows out, and collects in tears on the edges of the cuts. In this state the field is left for twenty-four hours, and on the following day the opium is collected by large blunt knives. Each head furnishes opium once only, and that to an extent of a few grains. The first sophistication which it receives is that practised by the peasants who collect it, and who lightly scrape the epidermis from the shell to augment the weight. This operation adds about one-twelfth of foreign matters. Thus collected, opium has the form of a glutinous and granular jelly. It is deposited in small earthen vessels, and beat up with saliva. When asked why water was not employed in the place of saliva, the answer was that water caused

it to spoil. It is afterwards enveloped in dry leaves, and in this state it is sold. The seeds of those poppies which have yielded opium are equally good for sowing the following year."

Some little variation will be found in the description of other writers of the methods practised in other parts of the East. Kæmpfer says that in Persia the incisions are made crosswise by a five-edged knife. Kerr states that in the province of Bahar "two longitudinal double incisions" are made "upon each half-ripe capsule, passing from below upwards;" care being taken that the internal cavity of the capsule is not penetrated.

β. **Description.**—In commerce, several varieties of opium are known. The principal kind, however, is that brought from Smyrna. But the recent events, which have occurred in China, will probably throw a considerable quantity of Indian opium into European commerce.

1. Smyrna Opium (*Opium Smyrnæum*).—This is the *Turkey* or *Levant opium* of commerce. It occurs in irregular rounded or flattened masses of various sizes, rarely exceeding 2 lbs. in weight, enveloped in leaves, and usually surrounded with the reddish capsules of some species of *Rumex* (*R. orientalis*, according to Koch,) (T. W. C. Martius's *Pharmakogn.* S. 322;) but *R. Patientia*, according to Merat. (*Dict. Mat. Méd.* t. v. p. 50.) Some of the flat cakes are without these capsules, and somewhat resemble Constantinople opium. When first imported, the masses are soft, and of a reddish-brown colour; but, by keeping, they become hard and blackish. Its lustre is waxy; its odour is strong and unpleasant; its taste is bitter, acrid, nauseous, and persistent. M. Guibourt regards the masses as being made up of agglutinated tears, and on this account as being the purest met with. It is, however, frequently met with largely adulterated. In one sample, weighing 10 ounces, I obtained 10 drachms of stone and gravel. Notwithstanding occasional frauds of this kind, Smyrna opium forms the best commercial opium.

Smyrna opium yields more *morphia* and *meconic acid* than either Constantinople or Egyptian opium. (Berthemot, *Journ. de Pharm.* xxiv. 444.) The quantity of *morphia* which can be obtained from this kind of opium is, perhaps, on the average, about eight per cent. Pelletier, (*ibid.* xxi. 572,) in an operation on about two ounces of this opium, procured a quantity of morphia equal to 7·08 per cent. From a pound he calculates eight or nine per cent. could be obtained. On an average, 12 per cent. of hydrochlorate of morphia may be procured from it. Dr. Christison obtained two drachms of *narcotine* from half a pound of the best Turkey opium: hence we may estimate the quantity at about four per cent. Hydrochlorate of morphia, prepared by Gregory's process from Turkey opium, contains, according to Dr. Gregory, (*ibid.* xxi. 246,) one-twelfth of codeia. Merck (*Pharm. Central-Blatt für* 1836, S. 491) examined five kinds of Smyrna opium: from the worst he procured 3 to 4 per cent. of morphia; from the best 13 to 13·5 per cent. In the latter variety he found 0·25 per cent. of codeia.

2. Constantinople Opium (*Opium Byzantinum* seu *Constantinopolitanum*).—I am indebted to Professor Guibourt for an authentic sample of this. His description of it is as follows:—"There are two sorts of it: one in very large irregular cakes, which are flattened like the Smyrna opium. This is of very good quality. The other is in small, flattened, regular cakes, of a lenticular form, from two to two and a half inches in diameter, and covered with a poppy leaf, the median nerves of which divide the disk into two parts. It has an odour similar to the preceding kind, but more feeble; it blackens and dries in the air. It is more mucilaginous than Smyrna opium." To this account I may add, that the cakes are never covered with the Rumex capsules, as those of Smyrna opium are. Berthemot describes two kinds of it; one soft, the other hard and brittle. Constantinople opium is inferior to the Smyrna kind, but superior to Egyptian opium.

Professor Guibourt says that this kind of opium yields only half the morphia procurable from the Smyrna opium. Berthemot also states that though it yields more morphia than the Egyptian opium, it gives less than the Smyrna kind. This, however, does not agree with the experience of Mr. Duncan, of Edinburgh, who has never failed to obtain an extraordinary

quantity of hydrochlorate of morphia from it. From an experiment of Dr. Christison's he calculates the quantity of hydrochlorate of morphia obtainable from it at 14 per cent. (*Journ. de Pharm.* xxi. 547.) Merck (*Pharm. Central-Blatt für* 1836, S. 491) procured 15 per cent. of pure morphia, but scarcely a trace of codeia. It is obvious, therefore, that Constantinople opium is of unequal quality. It is probable that opium of unequal qualities, and produced in several parts of the Turkish empire, is carried to the capital, and, being exported from thence, bears the name of Constantinople opium.

3. Egyptian Opium (*Opium Epyptiacum*).—It occurs in round flattened cakes of about three inches diameter, covered externally with the vestiges of some leaf. It is usually very dry. It is distinguished from the two preceding varieties by its reddish colour, analogous to that of Socotrine or hepatic aloes. Some very inferior qualities are sometimes offered for sale, and which appear to the sight and touch to be largely adulterated. By keeping, it does not blacken like the other kinds; its odour is less strong, and somewhat musty. Guibourt says, that by exposure to the air it becomes soft. Egyptian opium is, for the most part, inferior to either of the preceding kinds; but its quality is by no means uniform. Some kinds become damp by keeping.

Guibourt tells us it yields only five-sevenths of the morphia obtained from Smyrna opium. Berthemot also states that it contains less morphia than either of the preceding kinds of opium, and that the morphia is more mixed with narcotine. He further adds, that the morphia which it yields is purified with great difficulty. The watery infusion of Egyptian opium has a distinct odour of acetic acid. Dr. Christison obtained about 10¼ per cent. of pure white hydrochlorate of morphia from it, which, he says, is about the quantity procured from good Turkey opium. Merck (*op. supra cit.*) procured only from 6 to 7 per cent. of morphia, but much meconic acid.

4. Trebizon Opium (*Persian Opium*).—Some years since a quantity of opium was imported into this country from Trebizon, in the form of cylindrical sticks, which, by pressure, have become somewhat angular. Their length is about six inches; their diameter about half an inch, a little more or less. Each one is enveloped in a smooth shiny paper, and tied with cotton; its colour is similar to that of Socotrine aloes. It has the opiate odour stronger than that of the Egyptian kind, but less than Smyrna opium, and mixed somewhat with a musty odour: its taste is intensely bitter. It is commonly termed in commerce Persian opium, but the specimens I received came from Trebizon. It is a very inferior kind.

Merck (*Pharm. Central-Blatt für* 1836, S. 493) could obtain no morphia from it by the ordinary mode of proceeding. He, however, afterwards succeeded in obtaining about 1 per cent. It gave only a trace of narcotina. There must, I suspect, be some error in these statements, as this opium is certainly richer in morphia than is here stated.

5. Indian Opium (*Opium Indicum*).—Three varieties of Indian opium are known in commerce, viz.:—*Malwa*, *Benares*, and *Patna Opium*. As the two latter kinds are undistinguishable, I shall include them under one head of *Bengal Opium*.

a. Bengal Opium (*Benares* and *Patna Opium*).—A few chests of this kind have been recently imported. Its preparation is fully described by Dr. Butter. (*On the Prepar. of Opium for the China Market*, in *Journ. Asiat. Soc. of Beng.* v. 165, 1836.) I have been kindly furnished with samples of the Benares and Patna kinds, of the growth of the years 1835-36, and 1837-38, by Mr. Maitland, of the India House.

Bengal opium is imported in balls, each weighing about three lbs. and a half, and packed in chests, each containing about forty balls. The balls are hard, round, like cannon-balls, and about the size of a child's head. Externally each ball is made of poppy petals, firmly agglutinated by a paste called *lewa*, to form a firm but laminated envelope weighing about 14 oz. On cutting through this, the opium is found to be quite soft, homogeneous, apparently quite pure, and to have the consistence of a soft extract. Its colour is blackish brown. Its odour and taste are strong and pure opiate. On exposure to the air this opium

speedily becomes covered with mouldiness. Both *Bahar* or *Patna* and *Benares Opium* are exported from Calcutta. Bahar and Benares are the only districts of Bengal where opium is produced. Benares is most valued by the Chinese (Butter).

Further experiments are required ere we can speak with confidence as to the per-centage quantity of morphia and narcotina obtainable from Bengal opium. Dr. Smytten (*Trans. of the Med. and Phys. Soc. of Calcutta*, vol. vi.) procured only 2½ or 3 per cent. of morphia. But from some experiments which I have made, I consider this quantity to be considerably below the truth. Mr. Morson informs me that Benares opium contains rather more than half the quantity of morphia contained in good average Turkey opium.

Garden Patna Opium.—For a sample of this opium I am indebted to Dr. Christison. It is imported in square cakes (enclosed in thin plates of mica), about three inches in length and breadth, and one inch thick. It has the appearance, as Professor Guibourt describes it, of a well-prepared, shiny, dry, pharmaceutical extract. Its colour is blackish brown. Its odour is less powerful than that of Smyrna opium.

In the first edition of this work I described this kind of opium as *fine Malwa opium*. The following extract of a letter, which I have recently received from Dr. Christison, will explain the cause of this error:—"The common ball opium of Patna and Benares (which are all but identical) was long known in India to be inferior in quality. During the inspectorship of Mr. Fleming, of Barrochan, now in this country, he instituted inquiries, along with his assistant Captain Jeremie, as to the causes of its inferiority, and, among other reasons, was led to suppose it owed its softness, tarriness, and general low quality, to the 'ryots' storing the juice in bottles till it accumulated to a sufficient extent to be made up, and to fermentation consequently taking place. Means were therefore taken to get this juice before being long kept, and it was made up into square cakes, of which I sent you one under the incorrect name of Malwa opium—the name by which I got it." Mr. Fleming subsequently recognised the cakes in Dr. Christison's laboratory with his official stamp on them. Dr. Christison obtained 9·5 per cent. of muriate of morphia (snow-white) from it, a considerable portion of narcotine, and so large a proportion as one-twelfth or 8 per cent. of codeia.

This I presume is the opium employed by Merck (*Berl. Jahrb.* xxxvii. 289, 1837, and *Brit. Ann. of Med.* July 21, 1837) under the name of Bengal opium, and which, he says, was enclosed in plates of mica. In 100 parts he found *morphia* 8, *narcotine* 3, *codeia* 0·5, *thebaina* 1, *meconine* traces, and *porphyroxin* 0·5. Another sample of Indian opium, in round balls of half a pound each, and of the consistence of Calabrian extract of liquorice, yielded him 10 per cent. of morphia. (*Pharm. Central-Blatt für* 1836, 493.)

β. Malwa Opium.—A few years since this ranked among the inferior kinds of Indian opium, but it has been gradually rising in value, and is now highly esteemed. I have received two varieties of opium under this denomination. They were brought me from India by former pupils of mine.

αα. One kind consists of a round flattened cake or ball, weighing ten ounces. It seems to have been packed in a coarse kind of dust, composed of broken poppy petals. Its consistence is about that of moderately firm Smyrna opium. When cut into, it presents a homogeneous texture. Its colour is dark brown; its odour similar to that of Smyrna opium.

ββ. The other kind (described in the first edition of this work as *inferior Malwa opium*) is in flattened cakes without any exterior covering. It is dull, opake, blackish brown externally; internally somewhat darker and soft. Its odour is somewhat like that of Smyrna opium, but less powerful, and combined with a slight smoky smell.

Guibourt says it yields as much extract as Levant opium; but its insoluble residue wants the virous odour and glutinous consistence of the latter. It furnishes only one-third the quantity of morphia yielded by Smyrna opium. From common Malwa opium Dr. Smytten procured only from 3 to 5 per cent. of morphia; but, from fine samples, from 7¾ to 8 per cent.

Mr. E. Solly (*Proceedings of the Committee of Commerce and Agriculture of the Royal Asiatic Society*, p. 141, Lond. 1841) states that he found "occasional minute cavities full of a pale yellow oil" in a specimen of Malwa opium. This opium yielded him 80 per cent. of soluble matter.

γ. Cutch Opium.—Under this name I have received from Bombay a small cake of opium, rather more than an inch in diameter, and apparently enveloped

by the remnants of leaves. Its odour is much less powerful than that of Smyrna opium.

δ. *Kandeish Opium*.—In round flattened cakes, weighing about half a pound each. It is nearly black, is hard, brittle, and presents a gritty or granular fracture. It yielded Mr. E. Solly (*op. supra cit.*) 72 per cent. of soluble matter, and about 7 per cent. of morphia.

6. **English Opium** (*Opium Anglicum*).—It is in flat cakes or balls, enveloped with leaves. It resembles fine Egyptian opium more than any other kind: its colour is that of hepatic aloes; it has a moderately strong opiate odour.[1]

Mr. Hennell procured from 700 grains of English opium, prepared by Messrs. Cowley and Staines, 53 grains, or 7·57 per cent., of morphia; while from the same quantity of Turkey opium he obtained only 48 grains, or nearly 7 per cent., of morphia. (*Trans. Soc. Arts.* xliii. 57.) Mr. Morson, (*ibid.* l. 25,) from 20 oz. avoird. of the same British opium, procured only 384 grains, or about 4·4 per cent. of morphia, and 222 grains, or about 2·53 per cent. of narcotina. Probably the morphia obtained by Mr. Hennell was not freed from narcotina. Mr. Young declares British opium to be stronger than the commercial opium; six ounces of the former being equal to eight of the latter. (Duncan *Suppl. to the Ed. Disp.* p. 81.)

7. **French Opium** (*Opium Gallicum*).—I have not seen any samples of this. Pelletier (*Journ. de Pharm.* xxi. 570,) describes it as being deep reddish brown, and brittle when dry. Its taste was somewhat different to that of Smyrna opium. It left a less insoluble residuum than Eastern opium.

Pelletier procured more *morphia* from it than from Smyrna opium. In an experiment on about two ounces of each he obtained 10·38 per cent. from the former, and only 7·08 per cent. from the latter. It contained no *narcotina*. He obtained sensible traces of *codeia*, but none of *narceine*, *meconine*, or *thebaina*, perhaps because the quantity of opium experimented on was too small. The disappearance of one immediate principle (narcotina), and the augmentation of another (morphia), caused by climate, are interesting facts. Petit (*ibid.* xiii. 183,) got from 16 to 18 per cent. of morphia; and Caventou (quoted by Christison) obtained from 22 to 28 per cent. from French opium; but I presume the morphia was very impure.

8. **German Opium** (*Opium Germanicum.*)—I am unacquainted with this.

Biltz, of Erfurt, got from indigenous German opium 16½ and even 20 per cent. of *morphia*, where the opium had been procured from the *P. somniferum α. nigrum*; and between 6¼ and 9½ *narcotina*. But from opium made from *P. somniferum β. album* he got conversely 6·8 per. cent. of morphia, and 33 per cent. of narcotina.

Commerce of Opium.—The quantities of opium on which duty was paid during the last six years, are as follows (*Trade List*):

In 1834	27,253 lbs.	In 1838	30,824 lbs.
1835	30,398	1839	40,784
1836	38,553	1840	45,589
1837	36,833	1841	37,960

Since August 13, 1836, the duty has been 1s. per lb.; previous to that and from 1828 it was 4s. per lb. Of the above quantities the greater part was imported from Turkey.

The quantity of opium produced in Hindostan is enormous. In Patna and Benares its cultivation is a monopoly in the hands of government; and a revenue is derived from the Malwa opium, by a system of passes on shipment from Bombay. Of the whole quantity raised in Hindostan, it is calculated that about two-thirds have been sent to Canton, and the remainder to the Eastern Islands.[2] The following table is from Mr. R. Montgomery Martin's *Statistics of the Colonies of the British Empire*, Lond. 1839 (p. 366)—

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[1] I must refer those interested in the cultivation of the poppy, and production of British opium, to the papers of Mr. Ball, in *Trans. of Soc. of Arts*, xiv. 253; of Mr. Jones, *ibid.* xviii. 161; of Mr. Young, *Ibid.* xxxvii. 23; of Messrs. Cowley and Staines, *Ibid.* xl. 9; and of the Rev. G. Swayne, *Quart. Journ.* vols. viii. and ix.

[2] *Evid. taken before the Committee of the House of Lords on the affairs of the East India Company. No.* 646, 1830, p. 25.

Estimate of Quantity and Total Value of Indian Opium consumed in China during the years ending in 1832-33:—

Years.	*Patna.*	*Benares.*	*Malwa.*	*Total.*	
	Chests.	Chests.	Chests.	Chests (of one pecul, or about 133⅓ lbs. *avoird.*)	Amount in Spanish Dollars.
1827-28	4006	1128	4401	9535	10,425,075
1828-29	4831	1130	7171	13132	12,533,215
1829-30	5564	1579	6857	14000	12,057,157
1830-31	5085	1575	12100	18760	12,904,263
1831-32	4442	1518	8265	14225	11,501,584
1832-33	6410	1880	15403½	23693½	15,352,426

All the world knows that these enormous quantities of opium were smuggled into China (by the connivance of the local authorities) for the purpose of smoking. The vessels anchored at Lintin, about 70 miles from Canton, and delivered the opium to the boats of the Chinese buyers. "Malwa opium is considered by the Chinese as having a higher touch, but not so mellow nor so pleasant in flavour as the Patna opium. The smokeable extract, which each quantity of opium contains, is thus intimated by the Chinese,—(who use opium as we do wine or spirits):—Patna and Benares opium 45 to 50 touch: average 48; Malwa 70 to 75: average 72½; Turkey 53 to 57: average touch 55." (R. M. Martin, *op. supra cit.* p. 366.) The *smokeable extract* here referred to is an aqueous extract of opium prepared by the Chinese. A detail of the important events which have resulted from the active and extraordinary steps taken by this remarkable people to put a stop to the trade in opium, would be out of place in this work. Suffice it to say, that in 1839, no less than 20,283 chests of opium, valued at nearly £3,000,000 sterling, were delivered up to the Chinese, and by them destroyed by immersing the opium in water with lime and salt, and, when the whole had become a fetid mud, allowing it to escape into the river.[1]

Composition.—Few substances have been so repeatedly submitted to chemical investigation as opium. The mere reference to the different labours, which have been bestowed on it, would occupy more space than I can devote to the subject. I must, therefore, content myself with brief notices of the most important epochs in its chemical history, and a reference to some of the analyses which have been made of it.

In 1803 Derosne (*Ann. de Chim.* xlv. 257) discovered *narcotina*. In 1804 Sertürner (*Trommsdorff's Journ.* 1805, Bd. xiv. 1, S. 47) announced the existence of *meconic acid* and *morphia*. Seguin (*Ann. de Chim.* xcii. 225; and *Ann. de Chim. et Phys.* ix. 282) appears to have discovered them about the same time. Robiquet (*Ibid.* v. 275) confirmed these discoveries in 1814. In 1826 *meconine* was discovered by Dublanc jeune, and again in 1830 by Couerbe. (*Ibid.* l. 337.) In 1832 Pelletier (*Ibid.* l. 262) discovered *narceina*; and, in the same year, Robiquet (*Ibid.* li. 259) announced the existence of *codeia*. In 1837 Merck (*Pharm. Central Blatt für* 1837, S, 342) announced the existence, in opinion, of a new substance, which he called *porphyroxin*, but his statement requires confirmation.

Mulder's Analysis.	*Smyrna Opium.*				
	1	2	3	4	5
1. Morphia	10·842	4·106	9·852	2·842	3·800
2. Narcotina	6·808	8·150	9·360	7·702	6·546
3. Codeia	0.678	0·834	0·848	0·858	0·620
4. Narceine	6·662	7·506	7·684	9·902	13·240
5. Meconine	0·804	0·846	0·314	0·380	0·608
6. Meconic acid	5·124	3·968	7·620	7·252	6·664
7. Fat	2·166	1·350	1·816	4·204	1·508
8. Caoutchouc	6·012	5·026	3·674	3·754	3·206
9. Resin	3·582	2·028	4·112	2·208	1·834
10. Gummy extractive	25·200	31·470	21·834	22·606	25·740
11. Gum	1·042	2·896	0·698	2·998	0·896
12. Mucus	19·086	17·098	21.068	18·496	18·022
13. Water	9·846	12·226	11·422	12·044	14·002
Loss	2·148	2·496	0·568	2·754	3·332
Smyrna Opium	100·000	100·000	100·870	99·000	99·998

[1] See *Asiatic Journal*, vol. xxx. part ii. p. 310; also *Parliamentary Reports on the Trade with China*, No. 359, 1840; and *Corresp. relating to China*, 1840.

Schindler's Analyses.				*Biltz's Analyses.*			
	Smyrna Opium.	*Constantinople Opium.*	*Egyptian Opium.*		*Oriental Opium.*	*Indigenous Opium.* From *α. nigrum.*	*Indigenous Opium.* From *β. album.*
Morphia	10·30	4·50	7·00	Morphia	9·25	20·00	6·85
Narcotina	1·30	3·47	2·68	Narcotina	7·50	6·25	33·00
Codeia	0·25	0·52		Meconic acid (impure)	13·75	18·00	15·30
Narceine	0·71	0·42		Bitter extractive	22·00	8·50	11·00
Meconine	0·08	0·30		Deposit	7·75	4·75	2·20
Meconic acid	4·70	4·38		Albumen	20·00	17·50	13·00
Resin	10·93	8·10		Balsamic matter	6·25	7·65	6·80
Bassorin, caoutchouc, fat, and lignin	26·25	17·18		Caoutchouc	2·00	10·50	4·50
Salts and volatile oil	3·60	3·60		Gum with lime	1·25	0·85	1·10
Lime and magnesia	0·47	0·42	[90·32]	Sulphate of potash	2·00	2·25	2·00
Alumina, oxide of iron, silica, and phosphate of lime	0·24	0·22		Lime, iron, alumina, & phosphoric acid	1·50	1·85	1·15
Brown acid, soluble in alcohol and water	1·04	0·40		Woody fibre	3·75	0·80	1·50
Brown acid, soluble in water; gum, and loss	40·13	56·49		Ammonia, volatile oil, and loss	3·00	1·10	1·60
Total	100·00	100·00	100·00	Total	100·00	100·00	100·00

Analyses of opium have been published, in 1800 by Bucholz, (*Trommsdorff's Journ.* viii. S. 24,) in 1804 by Sertürner, in 1814 by Seguin, in 1817 by Braconnot, (*Journ. de. Phys.* lxxxiv. 225,) in 1818 by Buchner, (quoted by Schwartze, *Pharm. Tab.*) in 1819 by John, (Gmelin, *Handb. d. Chem.* ii. 1244,) in 1823 by Pfendler, (*Chem. Abhandl. ü. d. Opium.* Wien, 1823,) in 1824 by Lindbergson, (Gmelin, *op. supra cit.*) in 1826 by Merck (*Ibid.*), in 1826 by Geiger (*Ibid.*), in 1831 by Biltz, (*Pharm. Central-Blatt für* 1831, S. 757,) in 1832 by Pelletier, (*Ann. de. Chim. et de Phys.* l. 240,) in 1834 by Schindler, (*Pharm. Central Blatt für* 1834, S. 574,) and in 1836 by Mulder, (*Ibid. für* 1837, S. 574.)

The following substances may be regarded as the constituents of opium:—*Morphia*, *narcotina*, *codeia*, *narceia*, *meconine*, *thebaina*, or *paramorphia*, *pseudomorphia?*, *meconic acid*, *brown acid extractive*, *sulphuric acid*, *resin*, *fat oil*, *gummy matter*, *caoutchouc*, *albumen*, *odorous principle* (volatile oil?), and *lignin*.

1. Volatile Odorous Principle (*Volatile Oil?*).—The distilled water of opium has the peculiar odour of this drug, and by keeping deposits a ropy substance. Hitherto, however, all attempts to isolate the volatile odorous principle of opium have failed, and its nature, therefore, is as yet unknown. Nysten (Orfila, *Toxicol. Gén.*) swallowed two ounces of the distilled water without any sensible effect; and Orfila injected a like quantity of it into the jugular vein of a dog without apparently causing any inconvenience to the animal. The volatile principle cannot, therefore, possess much activity; but Nysten concludes that "the distilled water of opium, strongly saturated with the aromatic principle, is capable of producing drunkenness and sleep, when taken in a strong dose."

2. Morphia.—(Will be described hereafter.)

3. Codeia.—(*Codeine*).—So called from κωδεια, *a poppy head.* It is a white, crystalline solid, slightly soluble in cold, and still more so in boiling water. It is soluble in ether. It is insoluble in a cold weak solution of potash. If more codeia be added to boiling water than this liquid can dissolve, the excess melts and forms an oily layer at the bottom of the vessel; and, by cooling, a crystalline mass is obtained. It reacts as an alkali on test papers, and unites with acids to form crystalline salts.

From morphia, codeia is distinguished by its not becoming blue on the addition of sesquichloride of iron. It is also said not to redden nitric acid like morphia. All the specimens of codeia, which I have met with, became orange yellow on the addition of nitric acid. Moreover, ammonia does not precipitate it from its very diluted solution in hydrochloric acid, on account of its solubility in water; and this affords a means of separating morphia from codeia. The separation may be more easily effected by ether, which readily dissolves codeia; or by

alkalis (potash or soda), which dissolve morphia, but leave codeia. From meconine it is distinguished by its aqueous solution possessing marked alkaline properties, as manifested by its action on test papers. Tincture of nutgalls produces a copious precipitate (*tannate of codeia*) in solutions of codeia.

Anhydrous codeia consists of C^{35} H^{20} N^{1} O^{5}. It, therefore, contains an atom less of oxygen than morphia does. Its atomic weight is 284.

Crystallized in ether it contains no water. But crystallized in water it retains two atoms of water of crystallization.

The *salts of codeia* have not been much studied. The *nitrate* readily crystallizes. The *tannate* is insoluble in water. The *double hydrochlorate of morphia* and *codeia* is the salt at one time sold as hydrochlorate of morphia, by those who prepared it by Gregory's process. Hence it has been termed by the French pharmacologists *sel de Gregory*.

The *effects* of codeia and its salts have been imperfectly examined by Kunkel, Gregory, Barbier, and Magendie, but the results are very contradictory. Kunkel (*Journ. de Chim. Méd.* ix. 223) says it is a local irritant, becomes absorbed, excites the circulation, and produces convulsions; but that none of the animals on which the codeia was tried were either stupified or paralyzed. Magendie, (*Formulaire*, 87, 8^{me} éd.) however, says it causes sleep, and, when exhibited in large doses, stupor. He considers one grain of codeia equivalent to half a grain of morphia: two grains excite nausea and vomiting. Barbier (*Journ. de Chim. Méd.* x. 214 & 337) also states it produces sleep. Dr. W. Gregory (*Journ. de Chim. Méd.* p. 219) says that, in doses of five or six grains, it causes an excitement like that of intoxication, followed in a few hours by depression, nausea and sometimes vomiting.

Magendie proposes to use it as a substitute for morphia, to procure sleep and allay pain, in doses of from one to three grains. A *syrup of codeia* (composed of codeia, grs. xxiv.; distilled water, f℥iv.; sugar, ℥viij.) has been used in hooping cough. The dose for a child, of about seven years of age, is a tea-spoonful. It has been given in irritation of the gastric mucous membrane. (*Journ. de Pharm.* xxiv. 144.)

4. Narcotina (*Narcotine*).—So called from ναρκωτικος, *narcotic*. The greater part of the narcotina of opium is in the free state, as it is removable by ether without the aid of either acids or alkalis. It is a white, inodorous substance, crystallizing in prisms,—distinguished from morphia by being insipid, very soluble in ether, insoluble in alkalis, by its not becoming blue on the addition the sesquichloride of iron, by its not decomposing iodic acid, and, when quite pure, by its not yielding a brown colour when treated by chlorine and ammonia. Heated on a paper over a candle, it gives a greasy-looking stain to the paper. Nitric acid dissolves it, and acquires an orange tint. It does not affect vegetable colours, and by this character is readily distinguished from both morphia and codeia. It is insoluble in cold water, but dissolves in 400 parts of boiling water,—in 100 parts of cold alcohol,—or in 24 parts of boiling alcohol. The volatile oils also dissolve it. It consists of C^{46} H^{24} N O^{15}. Its atomic weight, therefore, is 446. The *salts of narcotina* have been but little examined. They are more bitter than those of morphia, redden litmus, and are precipitated from their solutions by infusion of nutgalls and by the alkalis. The *hydrochlorate* is crystallizable. Both this and the *sulphate* are very soluble in water.

Narcotina is extracted from the residue of the opium which has been subjected to the action of cold water. This is treated with water acidulated with either acetic or hydrochloric acid, and to the filtered solution ammonia is added. The precipitate treated with boiling alcohol yields narcotina, which deposits as the liquor cools. Narcotina may be separated from morphia by ether, which dissolves the narcotina, but leaves the morphia, or by a solution of potash, which dissolves the morphia, but leaves the narcotina, or by the cautious addition of weak acetic acid, which dissolves the morphia, and, unless the acid be greatly in excess, does not dissolve the narcotina.

When narcotina was first discovered, it was said to be the stimulant principle of opium; and Magendie states a grain of it, dissolved in olive oil, produced the death of a dog in twenty-four hours, while twenty-four times this quantity was given, dissolved in acetic acid, with impunity. Orfila, at one time, declared it was inert, then that it acted like morphia, and subsequently that its operation was remarkable and peculiar. Bally asserts that, in a solid state, it is inert; for 129 grains may be given, at one dose, without exciting any obvious effect. The truth is, I believe, that narcotina possesses but little activity; and I presume, therefore, that the first experimenters with it employed an impure substance. Dr. Roots gave gradually increased doses of it, up to a scruple, without the least injury. The bitterness of its sulphuric solution led him to employ it in intermittents, as a substitute for disulphate of quina. More recently attention has been drawn to it in India, by Dr. O'Shaughnessy, (*Brit. and For. Med. Rev.* vol. viii. p. 263) as an Indian indigenous substitute for quina; and nearly 200 cases of intermittent and remittent fevers, treated by it with success, have been published.

5. Narceine. (*Narceina*).—So called from ναρκη, *stupor*. It is a white, inodorous solid, crystallized in long, fine, silky needles, with a slightly bitter, and even somewhat metallic, taste. It dissolves in 230 parts of boiling water, or 375 parts of water at 60°. It fuses at about 198°, and at a higher temperature is decomposed.

Narceine has several very striking properties by which it is distinguished from other substances. The first of these deserving of notice is the action of mineral acids on it. Thus the sulphuric, nitric, and muriatic acids, so diluted with water that they cannot alter the elemen-

tary composition of narceine, give this substance a fine light blue colour, immediately on coming in contact with it. This alteration of colour does not appear to depend on any change in the elementary composition of narceine, since, by saturating the acids with ammonia, the narceine is precipitated unchanged. When much water is added, the blue colour disappears.

Another peculiar trait of narceine is, that it forms a bluish compound (*iodide of narceine*) with iodine: heat and alkalis destroy the colour. So that iodine is not an absolute test for starch.

The characters now mentioned are sufficient to distinguish narceine from all other known substances. In addition, I may add, that it does not form a blue colour with the sesquichloride of iron, as morphia does.

Narceine was at first supposed to be a vegetable alkali; but as it does not affect vegetable colours, nor combine with nor saturate acids, it is now regarded as a neutral principle. Narceine is composed of C^{28} H^{20} N O^{12}.

Two grains have been several times thrown into the jugular vein of a dog, without producing any appreciable effect. It is presumed, therefore, to be inert.

6. Meconine.—So called from μηκων, *a poppy*. It is a white, crystalline, odourless solid. Its taste, which at first is scarcely perceptible, is afterwards sensibly acrid. The crystals are six-sided prisms, with dihedral summits. It fuses at 194°, and becomes a colourless, limpid fluid. At a higher temperature it may be distilled. It dissolves in 265 parts of cold water, or in eighteen parts of boiling water. It is soluble in alcohol and in ether. It is distinguished from morphia and codeia by its not possessing alkaline properties. From morphia it is further distinguished by its great fusibility, its greater solubility in water, and its not becoming blue on the addition of sesquichloride of iron. Cold sulphuric acid dissolves meconine, the solution being limpid and colourless. If heat be applied, the liquid becomes dark. If the quantity of sulphuric acid be small in proportion to that of meconine, the liquid assumes a green colour. If chlorine gas be passed over fused meconine, the latter becomes blood-red, and on cooling forms crystals. The compound thus formed is composed of chlorine and some organic base: if the first be removed by oxide of silver, a white acid is obtained, which Couerbe calls *mechloic acid* (C^{14} H^{7} O^{10}). By the action of nitric acid on meconine we obtain *hyponitromeconic acid*, composed of one atom of meconine and half an atom of hyponitrous acid. Meconine is remarkable for not containing nitrogen. Its composition is C^{10} H^{5} O^{4}.

A grain dissolved in water, and injected into the jugular vein of a dog, produced no remarkable effect. Further experiments, however, are required before we can positively declare it to be an inert substance.

7. Thebaina.—(*Paramorphia*).—So called from *Thebes*, an ancient city of Egypt. It is a white, crystalline, fusible solid, having an acrid, styptic taste, very soluble in alcohol and ether, but hardly at all soluble in water. It possesses alkaline properties, and dissolves in weak acids. From these solutions it is precipitated by alkalis. An excess of alkali cannot dissolve it, unless, indeed, the alkaline solution be very concentrated. It fuses at 302°, but does not volatize at any temperature. It is distinguished from morphia by not becoming blue on the addition of the perchloride of iron, and by not forming crystallizable salts with acids. From codeia it differs in not crystallizing in large crystals, and in not forming crystallizable salts. With meconine and narceine it has no analogy, and from them it is distinguished by the want of the peculiar properties which characterize these bodies. It resembles narcotina more than any other substance, but is distinguished by the crystals being shorter or granular, and wanting the pearly brilliance possessed by those of narcotina; by its acrid taste; by its fusibility at 302°; by its greater solubility in alcohol; and by nitric acid when dropped on it converting it into a substance like a soft resin, before dissolving it. Pelletier considered it isomeric with morphia; —hence he called it *paramorphia*. According to Dr. Kane's analysis it consists of C^{35} H^{14} N O^{3}; and its atomic weight is 202. Couerbe's analysis gives another atom of oxygen. The last-mentioned chemist says that, by fusion, the crystals lose two atoms of water. Magendie states that one grain injected into the jugular vein, or placed in the pleura, acts like brucia or strychnia, and causes tetanus and death in a few minutes.

8. Pseudomorphia.—This is a substance which Pelletier has occasionally met with in opium. It is a whitish solid, which, like morphia, dissolves in caustic alkalis, is reddened by nitric acid, and made blue by contact with the sesquichloride of iron. But it does not decompose iodic acid, and cannot form salts with acids. It consists of C^{27} H^{15} N O^{14}. It is not poisonous; at least, nearly eight grains, given to a rabbit, produced no effect. Pelletier thinks that pseudomorphia must be some combination of morphia, in which this substance has lost its poisonous properties.

9. Porphyroxin?—This name has been given by Merck (*Pharm. Central-Blatt für* 1837, S. 342; and *Brit. Ann. of Med.* ii. 82) to a supposed new principle found in Bengal opium. It is described as crystallizable, fusible, soluble in alcohol, ether, and weak acids. Alkalis precipitate it from its acid solution. Further experiments are required to determine its existence and precise nature.

10. Resin.—Brown, insipid, inodorous, softened by heat, insoluble in water and ether, but soluble in alcohol and in alkaline leys. Nitrogen is a constituent of it.

11. Extractive.—The substance usually denominated the extractive of opium, is probably a heterogeneous body. It is brown and acid, and has been supposed to be one of the active principles of opium. The reasons for this opinion are the following:—In the *first* place, it has

been asserted that after the morphia has been separated from an infusion of opium by magnesia, the filtered liquor gives by evaporation an extract which produces the same kind of narcotic effect that opium does. (Berzelius, *Traité de Chim.* t. v. p. 136; and t. vi. p. 152.) *Secondly*, the effects of the known active principles of opium are not sufficiently powerful to authorize us to refer the whole of the active properties of opium to them. Thus on an average 100 parts of opium yield from 8 to 10 parts of morphia (the most active of the known constituents of opium), and, therefore, if this alkali were the only active principle, it ought to be 10 or 12 times as powerful as opium is. Now we know that morphia is but little, if at all, more active than opium, and, therefore, this last-mentioned substance either contains some other active principle, or the activity of morphia is surprisingly increased by the principle or principles with which it is naturally in combination. Butter (*Op. supra cit.*) says the insoluble residuum possesses considerably narcotic qualities.

12. Fatty Matter.—Yellow or brownish. Probably colourless when pure. It reddens litmus, and unites with alkalis to form soaps, from which acids disengage it apparently unchanged.

13. Meconic Acid.—Hitherto found in the poppy tribe only. It is usually procured from meconate of lime by acting on it, in hot water, with hydrochloric acid. The meconic acid crystallizes on cooling. The formula of the anhydrous acid is C^{14} H O^{11}. The crystallized acid contains 9 equivalents of water; and the acid dried at 212° contains 3 equivalents of water. When pure it is in the form of white, transparent, micaceous scales, which are soluble in four times their weight of boiling water. But at this temperature water decomposes it; carbonic acid is evolved, and a solution of *komenic acid* (C^{12} H^2 O^9+2 aq.) is obtained. Cold water dissolves a smaller quantity of meconic acid. Alcohol is also a solvent for meconic acid. By the dry distillation of meconic acid, it loses carbonic acid and water, and becomes *pyromeconic acid* (C^{10} H^3 O^5+aq.)

The *characteristics* of meconic acid are as follows:—1st. *It reddens the sesquisalts of iron*, forming the *meconate of the sesquioxide of iron*. Alkalis, protochloride of tin, and nitric acid, assisted by heat, destroy this red colour. Bichloride of mercury, which destroys the red colour of sulphocyanide of iron, does not decolorize a red solution of meconate of iron. 2dly. It forms, with a weak solution of *ammoniated sulphate of copper*, a green precipitate (*meconate of copper*). 3dly. It yields white precipitates (*meconates*) which are soluble in nitric acid, with *acetate of lead*, *nitrate of silver*, and *chloride of barium*. The acetates which, like meconic acid, redden the sesquisalts of iron, and might, therefore, be confounded with it, do not occasion precipitates with the salts of lead and of barium. 4thly. It is not reddened by *chloride of gold*, which reddens hydrosulphocyanic acid and the sulphocyanides.

It deserves especial notice that many substances enjoy equally with meconic acid the power of communicating a red colour to the sesquisalts of iron. The following are some of them:—the *acetates*, *hydrosulphocyanic acid*, and the *sulphocyanides*, the *saliva of man* and *of the sheep*, the *urine* of man (frequently), *infusion of white mustard*, *komenic*, *pyromeconic*, and *indigotic acids*, the liquid obtained by the action of hydrochloric acid on detonating silver, the decoctions of *Cetraria islandica* (p. 38) and of *Gigartina Helminthocorton* (p. 36).

Meconic acid is an inert substance. Sertürner swallowed five grains of it without observing any effect. Sömmering gave ten grains to a dog; Feneglio and Blengini eight grains to dogs, crows, and frogs, and four grains to various men: in all cases no effects were observed. (Richter, *Ausf. Arzneim.* Bd. ii. S. 616.) Combined with bases, it doubtless modifies their action. Meconate of soda, however, is not active, as Sertürner asserted. It is supposed that the effect of the morphia in opium is modified by its combination with meconic acid. I have already mentioned that this acid is said to be an antidote in cases of poisoning by bichloride of mercury (vol. i. p. 623). If, however, the statement be true, the fact is of little practical value, on account of the scarcity of the acid; for neither opium nor laudanum can be given in quantity sufficient to neutralize the effect of this salt, without proving deleterious. Moreover, we have other good and easily accessible antidotes. Anthelmintic properties have been ascribed to the acid and some of its salts.

Chemical Characteristics.—Litmus paper is reddened by a watery infusion of opium (or tincture of opium diluted with water), owing to a free acid (*meconic*). Sesquichloride of iron gives it a deep red colour (*meconate of iron*). Acetate and diacetate of lead occasion a copious gray precipitate (*meconate and sulphate of lead, with colouring matter*), which, treated by sulphuric acid or sulphuretted hydrogen, yields free meconic acid. Chloride of barium also causes a precipitate (*meconate and sulphate of baryta*). Ammonia renders the infusion turbid (*precipitated morphia and narcotina*). Tincture of nutgalls causes a precipitate (*tannates of morphia* and *codeia*). Nitric acid communicates to the infusion a red colour (*oxidized? morphia*). Iodic acid and starch cause, after some hours, a blue precipitate (*iodide of starch*). This last test does not always succeed. Chloride of gold causes a deep fawn-coloured precipitate.

TABULAR VIEW OF THE PRINCIPAL CHARACTERS OF THE CRYSTALLINE PRINCIPLES OF OPIUM.

Characters.	Morphia.	Pseudomorphia.	Codeia.	Narcotina.	Thebaina.	Narceine.	Meconine.
Taste	Very bitter	.... ?	Bitter	Insipid; the salts bitter	Rather acrid and metallic	Slightly bitter	Rather acrid.
Fusibility	Fusible	Infusible?	Fusible at 302°	Fusible at 338°	Fusible at 226°	Fusible at 198°	Fusible at 194°.
Ditto in Boiling Water	Infusible	Infusible	Fusible	....	....	Fusible	Fusible.
Solubility in Cold Water	Insoluble, or nearly so	Almost insoluble	Soluble in 80 pts.	Insoluble	Very slightly soluble	Soluble in 375 pts.	Soluble in 266 pts.
Solubility in Boiling Water	Soluble in 100 pts.		Soluble in 17 pts.	Very slightly soluble		Soluble in 230 pts.	Soluble in 19 pts.
Solubility in Cold Alcohol	Soluble in 40 pts.	Less soluble than in water	Very soluble	Soluble in 100 parts	Soluble in 10 pts.	Soluble	Soluble.
Solubility in Boiling Alcohol	Ditto in 30 parts			Readily soluble	Still more soluble	More soluble	Soluble.
Solubility in Cold Ether	Scarcely soluble				Very soluble	Insoluble	Soluble.
Solubility in Potash or Soda Ley	Soluble	Soluble	Insoluble in the cold ley	Insoluble, or nearly so	Insoluble, unless the ley be very concentrated	....	Soluble.
Basic quality Action on Test Paper	Alkaline	.... ?	Alkaline	Neutral	Alkaline	Neutral	Neutral.
Basic quality Salifiability	Salifiable	Not salifiable	Salifiable	Salifiable	Salifiable?	Not salifiable	Not salifiable.
Action of Nitric Acid	Reddened: solution red	Reddened	Solution not red	Made yellow: solution yellow	Gives it a resinous appearance, and dissolves it	Coloured blue by dilute acid	Solution yellow.
Coloured blue by Hydroch. Acid	.... Not	.... Not	.... Not	.... Not	.... Not	Coloured blue	.... Not.
Ditto by Sesquichloride of Iron	Coloured blue	Coloured blue	.... Not	.... Not	.... Not	.... Not	.... Not.
Coloured blue by Iodine	.... Not	.... ?	.... Not	.... Not	.... Not	Coloured blue	.... Not.
Decomposes Iodic Acid	Decomposes Iodic acid	.... ?	.... Not	.... Not	.... Not	.... Not	.... Not.
Precipitated by Infusion of Nutgalls	Precipitated	.... ?	Precipitated	Precipitated	.... ?	.... ?	.... ?
When fused reddened by Chl. Gas	.... Not	.... ?	.... Not	.... Not	.... Not	.... Not	Blood-red.
Composition	C_{35} H_{20} N_1 O_8	C_{27} H_{18} N_1 O_{14}	C_{35} H_{20} N_1 O_8	C_{48} H_{24} N_1 O_{18}	C_{25} H_{14} N_1 O_3	C_{28} H_{20} N_1 O_{12}	C_{16} H_8 O_4
Equivalent	.... 292	.... 306	.... 284	.... 446	.... 202	.... 298	97 (?)
Water of Crystallization	2 atoms	.... ?	2 atoms	3 or 4 per cent.	1 atom	.... ? ...	None.
Poisonous	Poisonous	Not poisonous	Poisonous	Inert?	Poisonous	Inert?	Inert?

*** I have had no opportunity of verifying the statements in this column.

Application to Medico-legal Purposes.—On examining the alimentary canal of persons destroyed by opium, it not unfrequently happens that no traces of the poison can be obtained. I have met with several instances of this, and others are referred to by Dr. Christison. (*On Poisons.*) Either, therefore, opium is rapidly absorbed, and its unassimilated parts thrown out of the system by the excretories, or the constituents of this substance are digestible and assimilable.

The characters available for the detection of opium are twofold, *physical* and *chemical*.

1. PHYSICAL CHARACTERISTICS.—Whether in the solid state or dissolved in water or spirit, opium possesses three physical properties, by one or more of which it may be frequently recognised. These are, *a more or less brown colour*, *a remarkable and peculiar odour*, and *a bitter taste*. Of these the odour is the only characteristic one. In the alimentary canal it is strongest when the stomach is just opened, or when the opiate liquor is just reaching the boiling point. Other odours, however, frequently mask it. The analogy between the odours of lactucarium and opium deserves notice.

2. CHEMICAL CHARACTERISTICS.—The chemical tests of opium are those for meconic acid and morphia above mentioned. In a case of suspected poisoning, the stomach and duodenum (cut into small pieces), with their contents, are to be digested in distilled water, and the solution filtered successively through a sieve, muslin, and paper. A little acetic acid added to the water coagulates any caseum, and is thought to facilitate the solution of the morphia. Its presence is objectionable, on account of the red colour produced by the action of the acetates on the ferruginous salts, and which stimulates that developed with these salts by meconic acid.

α. Application of trial tests.—To a small portion of the filtered liquid apply the following tests:

1. A few drops of *tincture of chloride of iron*, which produces a red colour (*meconate of iron*) in an opiate solution.—The *fallacies* of this test have been before stated (see p. 688).
2. Apply excess of *strong nitric acid*, which also reddens (*oxidizes? morphia*) opiate liquors.—The *fallacies* of this are pointed out at p. 716.
3. Add *iodic acid* and *starch*, and set aside for twenty-four hours. Blue iodide of starch is sometimes formed if morphia be present (unless, indeed, the quantity be very minute).—The *fallacies* of this are stated at p. 716.

The success or failure of these tests is not to be considered as absolutely decisive as to the presence or absence of opium.

β. Separation of the Morphia and Meconic Acid.—Add to the filtered liquor a considerable excess of a solution of acetate of lead, and set aside in a tall vessel for the precipitate (*meconate and sulphate of lead, with colouring matter*) to subside, leaving a clear liquor (*acetates of morphia and lead*, &c.) Pour off the latter, and collect the precipitate on a filter.

Before adding the acetate of lead, it may be sometimes necessary to evaporate the liquor, in a water-bath, to the consistence of syrup, which is to be digested and boiled in alcohol, and the alcoholic tincture evaporated, and the residuum dissolved in water. To the filtered solution add the acetate of lead. This complication of the process is not usually necessary. Furthermore, by boiling with water, meconic acid is decomposed.

The above-mentioned clear liquor and the lead precipitate are then to be tested (the first for morphia, the second for meconic acid), as follows:

1. *Proceeding with the lead precipitate* (meconate and sulphate of lead, and colouring matter).

Suspend the lead precipitate in water contained in a conical glass (see fig. 82, vol. i. p. 526), and pass a stream of sulphuretted hydrogen through it, to convert the lead into a sulphuret, which is to be removed by filtration. The clear liquor is then to be gently heated (to expel the excess of sulphuretted hydrogen), and, if necessary, concentrated by evaporation. Or add a few drops of diluted sulphuric acid to the meconate of lead, by which an insoluble sulphate of lead is formed, and meconic acid left in solution. Boiling decomposes the meconic acid. The tests for meconic acid (p. 688) are then to be applied, viz.:

a, Tincture of chloride of iron.
b, Ammoniacal sulphate of copper.
c, Chloride of gold.
d, Acetate of lead.

2. *Proceeding with the clear liquor* (solution of the acetates of morphia and lead).

Place the clear liquor in a conical glass (fig. 82, vol. i. p. 526), and pass through it a stream of sulphuretted hydrogen, to precipitate the lead, and then filter. Then boil the filtered liquor, and, if necessary, concentrate by evaporation. To the clear liquor apply the tests for morphia, (see p. 716), viz:

a, Strong nitric acid in excess.
b, Iodic acid and starch (several hours may be necessary for the success of this test).
c, Tincture of chloride of iron (this test will only succeed with solid morphia, or very concentrated solutions).
d, Ammonia.
e, Infusion of nutgalls (this test will not answer if much free acid be in the liquor).
f, Chlorine, and afterwards ammonia.

Dr. Christison observes, that "it will often happen, in actual practice, that the only indication of opium to be procured by the process consists in the deep red colour struck by permuriate of iron with the meconic acid. Now, will this alone constitute sufficient proof of the presence of opium? On the whole, I am inclined to reply in the affirmative." I regret I cannot agree with him in this conclusion, since several other substances produce the same colour, and three of these are very likely to be met with in the alimentary canal, namely, the acetates, (thus acetate of ammonia or acetate of potash administered medicinally), mustard, and saliva. In regard to the latter substance, he remarks, "it is seldom possible to procure a distinct blood-red coloration from the saliva, except by evaporating a large quantity to dryness, and redissolving the residue in a small quantity of water; and I question whether it can be separated at all after the saliva is mixed with the complex contents of the stomach." I am sorry again to be at issue with so high an authority, but our results being discordant, it is but right I should state my experience. In a large majority of cases I find saliva is distinctly and unequivocally reddened by the persalts of iron. In some few cases only have I observed this test indistinct. I have several times obtained from the stomach of subjects in the dissecting-room a liquor which reddened the salts of iron.

Estimation of the Purity and Strength of Opium.—Opium is brought into the market of very unequal degrees of purity, in consequence of its having been subjected to adulteration; and partly, perhaps, from the employment of different methods of preparation. Moreover, its consistence is by no means uniform; that of some kinds being quite soft (as the Patna and Benares), and of others quite hard (as some of the Egyptian opium). As this difformity depends on the presence of unequal quantities of water, an obvious variation of strength is the consequence. Moreover, the quantity of morphia in good opium of different or even of the same localities is by no means constant. Furthermore, opium, from which the morphia has been extracted, has been fraudulently introduced into commerce. (*Journ. de Pharm.* xxiv. 325, 446; xxv. 297; also *Journ. de Chim. Méd.* iv. 2nde Sér. pp. 335, 432.) It is highly desirable, therefore, to have a ready, easy, accurate, and precise method of determining the purity and strength of opium. I regret to state that such a method is still a desideratum.

1. Of the Estimation of the Water.—This will be readily judged of by the consistence, but still better by observing the loss on drying a given weight of the opium.

2. Of the Detection of Foreign Bodies.—A physical examination of opium will frequently detect impurities (as leaves, bullets, stones, fruits, &c.) If a decoction of the suspected opium be made and strained, various foreign matters are often left on the sieve. In this way I obtained 10 drachms of small stones and gravel from 10 ounces of opium. On another occasion I detected a gelatiniform substance, which was insoluble in both water and alcohol, in an opium (Egyptian?), the tincture of which could not be rendered clear by filtration. A decoction of opium, when cold, should not give a blue precipitate (*iodide of starch*) on the addition of tincture of iodine: if it do, the presence of starch or flour is obvious.

3. Of the Estimation of the Quantity of Morphia in Opium. *Morphiometry.*—This is a subject of no slight difficulty. A remark connected with it, which deserves notice, is, that there is no constant ratio between the quantity of morphia in a given sample of opium and that of any other constituent. Berthemot, (*Journ. de Pharm.* xxiv. 445,) however, is of opinion that it is in the ratio of that of the meconic acid. The correctness of this opinion is not borne out by my own observation, and was positively denied by Robiquet. (*Op. cit.* p. 438.) It follows, therefore, that the extraction of the morphia is the only true morphiometrical method of proceeding. Several methods of effecting this have been proposed.

α. Process of the Edinburgh Pharmacopœia.—"A solution of 100 grains, macerated 24 hours, in two fluidounces of water, filtered, and strongly squeezed in a cloth, if precipitated by a cold solution of half an ounce of carbonate of soda in two waters, and heated till the precipitate shrinks and fuses, will yield a solid mass on cooling, which weighs, when dry, at least 11 grains, and, if pulverized, dissolves entirely in solution of oxalic acid."—*Ph. Ed.* 1839. This is a modification of the process for procuring disulphate of quina (see p. 445), and of estimating the quality of yellow bark (see p. 433). The fused mass obtained by the process is morphia, narcotine, and resinous extractive. From the trials I have made of this process, I am inclined to speak very doubtfully of its value. Morphia is soluble in a solution of carbonate of soda, and, therefore, variations in the degree of heat applied to the liquor, as well as in the time during which it is subjected to heat, will be attended with corresponding variations in the results. Nay, if the heat be maintained too long, the whole of the morphia will be dissolved! Hence, therefore, to prove successful, this process requires more precautions than the directions of the College would lead one to imagine.

β. Thiboumary's process.—Prepare an aqueous extract of the opium to be examined, and dissolve it in water. Add ammonia to the boiling liquor, [taking care not to add much ex-

cess] and, when cool, filter. Wash the precipitate on the filter first with cold water, then with proof spirit, and afterwards dry it. Then boil it with animal charcoal in rectified spirit, and evaporate the filtered liquor, by which crystals of morphia are procured. (*Journ. de Chim. Méd.* iv. 405, 2e Sér.)—The following modifications of the process will be found valuable. After the precipitate on the filter has been washed with water, dry it, mix it with proof spirit, and add drop by drop acetic acid until the solution slightly reddens litmus. By this means the morphia, and not the narcotina, will be dissolved. Precipitate the morphia from the filtered solution by ammonia.—This perhaps is the best process for determining the goodness of opium at present known.

γ. Berthemot's process.—To a filtered infusion of opium add chloride of calcium, boil, filter (to get rid of the meconate and sulphate of lime), and evaporate to the consistence of syrup. The residuum should form a granular crystalline mass (principally hydrochlorate of morphia), which is to be separated from the mother-water and purified by resolution in water. (*Journ. de Pharm.* xxiv. 448.) This is an application of Gregory's process hereafter to be described. It appears to be an objectionable method; as a considerable portion of the morphia will be left in the mother-liquor.

δ. Couerbe's process.—Boil an infusion of opium with lime (which dissolves the morphia) and filter through paper. Saturate the filtered liquor with an acid, and precipitate the morphia by ammonia. This, perhaps, is the most speedy process for the detection of opium.

Physiological Effects. *α. On Vegetables.*—The effects of opium on plants have been principally examined by Marcet (*Ann. de Chim. et Phys.* xxix. 20) and Macaire. (*Ibid.* xxxix. 213.) The latter writer states, that the stamens of the barberry (*Berberis vulgaris*) and the leaves of the sensitive plant lost their contractility, and soon died, when the stems of these vegetables were immersed in an aqueous solution of opium. But I have tried this experiment with a different result. I immersed a flowering stem of the barberry in water, to which tincture of opium had been added. In thirty hours I could not perceive any effect on the plant. The stamens, even in the overblown flowers, still retained their contractility. Charvet states that he watered a sensitive plant with a moderately strong infusion of opium forty-eight days, without affecting the irritability of the plant. By immersing a portion of Chara in a solution of opium the circulation of this plant becomes slower, is soon suspended, and is ultimately stopped.[1]

β. On Animals generally.—The operation of opium on animals has repeatedly been the subject of physiological investigation. An abstract of a considerable number of experiments made by various individuals has been published by Wibmer. (*Wirk. d. Arzneim. u. Gifte*, Bd. iv. S. 74, et seq.) The most complete and extended series of experiments is that made by Charvet, (*De l'Action comp. de l'Opium*, Paris, 1826,) on the different classes of animals, for the purpose of determining its comparative action. While on all it has been found to act as a poison, its effects are observed to vary somewhat, according to the degree of developement of the nervous system (see vol. i. p. 118).

In the invertebrated animals opium causes weakness or paralysis of the contractile tissues, with gradual sinking, and death. Thus in the *polygastrica* and the *annelides*, it first accelerates the animal movements, but afterwards paralyses them. Now in the lower invertebrata, a central nervous apparatus is altogether wanting; while in the higher animals of this class, it is not sufficiently developed to exercise that influence over the whole individual which we observe it to possess in the vertebrated classes.

In the vertebrated animals we have a high developement of the central organs of the nervous system, and a consequent increase in the number of symptoms caused by opium. Thus in *fishes*, *amphibials*, and *reptiles*, we observe, in addition to the weakened and paralytic condition of the contractile tissues, convulsions. In the fish, the convulsive contractions bend the body laterally; whereas, in the other vertebrata, the superior dorsal muscles are affected, and hence the head and tail are elevated. These differences obviously depend on the disposition of the muscles. Proceeding in the ascending order, we observe in *birds* and

[1] Meyen, *Report on the Progress of Vegetable Physiology during the year* 1837, translated by W. Francis, p. 14. Lond. 1839.

mammals, besides the paralysis and convulsions, stupor. The last-mentioned symptom, however, is principally manifested in the highest of the mammals, man,—that is, in that animal which has the most highly developed brain, while, in some of the lower mammals, as the ruminants, it is scarcely observed; and even in the carnivora, as dogs, it is very slight. It is somewhat remarkable that the stupor is more manifest in birds than in the lower mammals. Moreover, it is not undeserving of notice, that the operation of opium on the different races of man is not uniform, as already noticed, (see vol. i. p. 148). On the negro, the Malay, and the Javanese, it more frequently acts as an excitant, causing furious madness, or delirium and convulsions. Are we to ascribe the less frequent occurrence of these symptoms in the Caucasian variety to the greater developement of his brain? In conclusion, then, it appears that the effects of opium on the animal kingdom have a relation to the degree of developement and influence of the nervous system.

γ. *On Man.*—I propose to examine the effects of opium under three heads or subdivisions:—*first*, the effects of one or a few doses employed medicinally; *secondly*, the effects of the habitual employment of opium, either by chewing or smoking it; and *thirdly*, its effects on the different systems of organs.

1. *Effects of one or a few doses.*—We may consider these under three degrees of operation.

First degree of operation.—In *small doses*, as from a quarter of a grain to one grain, opium generally acts as a stimulant, though in this respect the symptoms are not uniform. Usually the vascular system is somewhat excited, and a sensation of fulness is experienced about the head. Dr. Crumpe (*Inq. into the Nat. and Prop. of Opium*, p. 33, 1793) took one grain of opium when his pulse was at 70, and the alteration in the number of beats was as follows:

In	2	5	10	15	20	25	30	35	40	45	50	55	60 minutes.
Pulse beat . .	70	74	76	76	74	74	74	72	72	70	70	70	70

The excitement in the cerebral vascular system is accompanied by alterations in the condition of the nervous functions. The mind is usually exhilarated; the ideas flow more quickly; a pleasurable or comfortable condition of the whole system is experienced, difficult to describe; there is a capability of greater exertion than usual. These symptoms are followed by a diminution of muscular power, and of susceptibility to the impression of external objects; a desire of repose is experienced, with a tendency to sleep. While these effects are taking place, the mouth and throat become dry, and hunger is diminished, though the thirst is increased; and slight constipation usually follows. Such are the ordinary effects of a small dose of opium on persons unaccustomed to its use. By repetition, however, its influence becomes considerably diminished; and those, therefore, who resort to it for the purpose of producing a pleasurable excitement, are obliged to augment the dose to keep up an equal effect, (see vol. i. p. 146.)

Second degree of operation.—Given in a *full medicinal dose* (as from two to four grains), the stage of excitement is soon followed by that of depression. The pulse, which at first is increased to fulness and frequency, is afterwards reduced below the natural standard. The effect of two grains and a half on Dr. Crumpe (when his pulse was beating at 70) were as follows (*op. supra cit.* p. 85):

In . . .	5	10	15	20	25	30	35	40	45	50	55	60	75	90 minutes.
Pulse beat	74	74	74	76	78	80	72	70	64	64	66	70	70	70

The skin becomes hot; the mouth and throat dry; the appetite diminished; the thirst increased; and frequently nausea, or even vomiting, are induced. The symptoms of excitement soon pass away, and a state of torpor succeeds: the individual seems indisposed to exertion, the muscular system appears enfeebled; the force of external impressions on the organs of the senses is diminished; and the ideas become confused. This state is followed by an almost irresistible desire of sleep, which is frequently attended by dreams—sometimes of a pleasing, at others of a frightful nature.

These effects are usually succeeded by constipation (which may continue for several days), by nausea, furred tongue, headache, and listlessness.

Third degree of operation: poisonous effects of opium.—Dr. Christison has so briefly summed up the effects of a poisonous dose of opium, that I cannot do better than quote his statement:—"The symptoms of poisoning with opium, when it is administered at once in a dangerous dose, begin with giddiness and stupor, generally without any previous stimulus. The stupor rapidly increasing, the person becomes motionless and insensible to external impression; he breathes very slowly, generally lies quite still, with his eyes shut and the pupils contracted; and the whole expression of the countenance is that of deep and perfect repose. As the poisoning advances, the features become ghastly, the pulse feeble and imperceptible, the muscles exceedingly relaxed, and, unless assistance is speedily procured, death ensues. If the person recovers, the sopor is succeeded by prolonged sleep, which commonly ends in twenty-four or thirty-six hours, and is followed by nausea, vomiting, giddiness, and loathing of food."

2. *Habitual Use of Opium.*—Of those who habitually employ opium as an intoxicant, some chew, or eat it; others smoke it.

Opium-eating.—The ill effects of opium-eating have been described by most travellers in Turkey and Persia, where this practice is carried to a greater extent than in any other part of the world. In the writings of Dr. Russell, (*Nat. Hist. of Aleppo*, i. 126, 1794,) Chardin, (*Voy. en Perse et autres Lieux de l'Orient*,) the Baron de Tott, (*Mém. sur les Turcs et les Tart.* 1785,) Pouqueville, (*Voy. en Morée, en Constant.* t. ii. p. 123, 1805,) and Madden, (*Travels in Turkey*, &c. vol. i. p. 23, 1829,) will be found notices of these effects. The following extract is from one of the latest accounts, that of Dr. Oppenheim[1]:—

"The causes leading to the use of opium are many, and among them may be reckoned the following:—long-continued diarrhœa, as a remedy for which opium is used in the first instance, and its use afterwards continued from habit; chronic coughs, in which opium is also used as a popular remedy; habitual drunkards also frequently have recourse to opium as a new stimulus, after they have abjured wine in some fit of repentance. Persons holding high offices or dignities in the state also have recourse to opium, when the preservation of their character forbids them the use of wine: some very strict believers also take opium as a restorative in cases of great exertion, as the *Tartars* (couriers), who travel with astonishing celerity.

"Opium-eaters generally begin with doses of from half a grain to two grains, and gradually increase the quantity till it amounts to two drachms and sometimes more a day: they usually take the opium in pills, but avoid drinking any water after having swallowed them, as this is said to produce violent colic: to make it more palatable, it is sometimes mixed with syrups or thickened juices; but in this form it is less intoxicating, and resembles mead; it is then taken with a spoon, or is dried in small cakes, with the words '*Mash Allah*,' 'the work of God,' imprinted on them.

"The effect of the opium manifests itself one or two hours after it has been taken, and lasts for five or six hours, according to the dose taken and the idiosyncrasy of the subject. In persons accustomed to take it, it produces a high degree of animation, which the *Theriaki* (opium-eaters) represent as the acmé of happiness.

"The habitual opium-eater is instantly recognised by his appearance. A total attenuation of body, a withered, yellow countenance, a lame gait, a bending of the spine, frequently to such a degree as to assume a circular form, and glossy, deep-sunken eyes, betray him at the first glance. The digestive organs are in the highest degree disturbed, the sufferer eats scarcely any thing, and has hardly one evacuation in a week; his mental and bodily powers are de-

[1] *Ueber d. Zust. d. Heilk. u. über d. Volkskrankh. in d. Europ. u. Asiat.-Turkei.* Hamb. 1833. Also *Brit. and For. Med. Rev.* vol. iv. p. 394.

stroyed,—he is impotent. By degrees, as the habit becomes more confirmed, his strength continues decreasing, the craving for the stimulus becomes even greater, and to produce the desired effect, the dose must constantly be augmented.

"When the dose of two or three drachms a day no longer produces the beatific intoxication so eagerly sought by the Opiophagi, they mix the opium with [corrosive] *sublimate*, increasing the quantity till it reaches to ten grains a day; it then acts as a stimulant.

"After long indulgence the opium-eater becomes subject to nervous or neuralgic pains, to which opium itself brings no relief. These people seldom attain the age of forty, if they have begun to use opium at an early age. The fasts in the month of Ramasan are for them fraught with the most dreadful tortures, as during the whole of that month they are not allowed to take any thing during the day. It is said that, to assuage their sufferings, they swallow before the morning prayer, besides the usual dose, a certain number of other doses, each wrapped up in its particular paper, having previously calculated the time when each envelope shall be unfolded, and allow the pill to produce the effects of their usual allowance. When this baneful habit has become confirmed, it is almost impossible to break it off; the torments of the opium-eater, when deprived of this stimulant, are as dreadful as his bliss is complete when he has taken it; to him night brings the torments of hell, day the bliss of paradise. Those who do make the attempt to discontinue the use of opium, usually mix it with wax, and daily diminishing the quantity of the opium, the pill at last contains nothing but the wax."

For an account of the effects produced on English opium-eaters, I may refer to the well-known confessions of Mr. De Quincey (*Confessions of an English Opium-eater*,) and of the late Mr. S. T. Coleridge. (Cottle's *Early Recollect. of the late S. T. Coleridge*, vol. ii. p. 149, et seq. Lond. 1837.) Numerous instances of the enormous quantity of opium which, by habit, may be taken with impunity, have been published. One of these I have already referred to (see vol. i. p. 147). Dr. Chapman (*Elem. of Therap.* ii. 199,) tells us that he knew a wine-glassful of laudanum to be given several times in the twenty-four hours. "But what is still more extraordinary," says this author, "in a case of cancer of the uterus, which was under the care of two highly respectable physicians (Drs. Monges and La Roche) of Philadelphia, the quantity of laudanum was gradually increased to three pints, besides a considerable quantity of solid opium in the same period." Pinel mentions a lady who required 120 grains of opium to give her ease in cancer of the uterus.

Some doubt has been entertained as to the alleged injurious effects of opium-eating on the health, and its tendency to shorten life; and it must be confessed that in several known cases which have occurred in this country no ill effects have been observable. Dr. Christison (*Treat. on Poisons*,) has given abstracts of eleven cases, the general result of whose histories "would rather tend to throw doubt over the popular opinion." A few years ago, a Life-Assurance Company, acting on this general opinion, resisted payment of a sum of money, on the ground that the insurer (the late Earl of Mar) had concealed from them a habit which tends to shorten life. But the case was ultimately compromised. Dr. Burnes (*Sketch of Hist. of Cutch*, p. 9, Edinb. 1839,) asserts that the natives of Cutch do not suffer much from opium-eating.

In those cases of disease (usually cancerous) in which enormous doses of opium are taken to alleviate pain, I have usually observed constipation produced. But Dr. Christison says, "constipation is by no means a general effect of the continued use of opium. In some of the cases mentioned above, no laxatives have been required; in others, a gentle laxative once a week is sufficient."

In 1841 an opium-eater, aged 26, was admitted into the London Hospital. He was accustomed to take two or two and a half drachms of solid opium daily. He originally began its use to relieve the attacks of Angina Pectoris. He was now most anxious to leave off this habit; though the difficulty of doing so was extreme. It did not diminish, but, according to his assertion, augmented his appetite; for, after each dose, he ate voraciously. At first when he commenced its use it caused dryness of the mouth and throat and constipation, but latterly his bowels were regular as before he commenced the use of this drug. His pulse ranged from 88 to 96. His urine was somewhat less than natural. The condition of the skin varied; in general it was dry, but occasionally was covered with profuse perspiration. He described the effect of the opium on his mental faculties as those of calmness, comfort, and serenity. Under its use he was able to support great bodily and mental fatigue. He never experienced the ex-

hilarating and pleasurable sensations described by De Quincey. His feelings, when not under the influence of opium, were most distressing. Mr. Davies (an intelligent pupil) described his condition at this time as follows:—eyes hollow, dark, and sunken; features haggard; hands trembling; voice and manner anxious; mouth parched; appetite wanting; sleeplessness. Unable to sleep for want of his accustomed dose, he used to pace the ward of the hospital at night almost frantic though quite sensible of his miserable condition, and anxious to abandon the practice.

Opium-smoking.—I have already referred to the use of the enormous quantities of opium consumed in China and the islands of the Indian Archipelago by smoking. The *smokeable extract*, called *chandoo* (see p. 655), is made into pills about the size of a pea. "One of these being put into the small tube that projects from the side of the opium-pipe, that tube is applied to a lamp, and the pill being lighted, is consumed at one whiff or inflation of the lungs, attended with a whistling noise. The smoke is never emitted by the mouth, but usually receives vent through the nostrils, and sometimes, by adepts, through the passage of the ears and eyes." (Marsden, *Hist. of Sumatra*, p. 278, 3d ed.) The residue in the pipe is called *Tye-chandoo*, or fæcal opium, and is used by poor persons and servants.

The mode of using the pipe has been depicted by Mr. Davies. (*The Chinese*, vol. ii. p. 459.) Some details respecting the mode of smoking opium has been given by Dr. Hill. (*The Times* newspaper for Dec. 3d, 1841.)

In the first edition of this work I stated that though the immoderate practice of opium-smoking must be highly detrimental to health, yet that I believed the statements of Medhurst (*China*, 1838,) and others applied to cases in which this practice was carried to excess; and I observed that an account of the effects of opium-smoking by an unbiassed and professional witness was a desideratum. My opinion was founded on the statements of Botta (Froriep's *Notizen*, xxvi.) and Marsden. (*Op. supra cit.* p. 278.) The latter, a most accurate writer, observes that "the *Limun* and *Batang Assei* gold-traders, who are an active and laborious class of men, but yet indulge as freely in opium as any others whatever, are, notwithstanding, the most healthy and vigorous people to be met with on the island."

This desideratum has been recently supplied by Mr. Smith, (*Lancet*, Feb. 19, 1842,) surgeon, of Pulo Penang, whose statements fully confirm my opinion. For though the practice is most destructive to those who live in poverty and distress, and who carry it to excess, yet it does not appear that the Chinese, in easy circumstances, and who have the comforts of life about them, are materially affected, in respect to longevity, by the private addiction to this vice. "There are many persons," observes Mr. Smith, "within my own observation, who have attained the age of sixty, seventy, or more, and who are well known as habitual opium-smokers for more than thirty years past."

The first effect of this drug on the Chinese smokers is to render them more loquacious and animated. Gradually the conversation drops, laughter is occasionally produced by the most trifling causes, and to these effects succeed vacancy of countenance, pallor, shrinking of the features, so that the smokers resemble people convalescing from fever, followed by deep sleep for half an hour to three or four hours. An inordinate quantity causes headache, vertigo, and nausea. The Malays are rendered outrageous and quarrelsome by the opium-pipe.

It is extremely difficult to discontinue the vice of opium-smoking, yet there are many instances (among which is the present Emperor of China) of its being done. The continuance of this destructive practice deteriorates the physical constitution and moral character of the individual, especially among the lower classes. Its powerful effects on the system are manifested by stupor, forgetfulness, deterioration of the mental faculties, emaciation, debility, sallow complexion, lividity of lips and eyelids, languor and lacklustre of the eye, appetite either destroyed or depraved, sweetmeats or sugar-cane being the articles that are most relished. "In the morning these creatures have a most wretched

appearance, evincing no symptoms of being refreshed or invigorated by sleep, however profound. There is a remarkable dryness or burning in the throat, which urges them to repeat the opium-smoking. If the dose be not taken at the usual time, there is great prostration, vertigo, torpor, discharge of water from the eyes, and in some an involuntary discharge of semen, even when wide awake. If the privation be complete, a still more formidable train of phenomena takes place. Coldness is felt over the whole body, with aching pains in all parts. Diarrhœa occurs—the most horrid feelings of wretchedness come on; and, if the poison be withheld, death terminates the victim's existence." The offspring of opium-eaters are weak, stunted, and decrepit.

4. *Action of Opium on the different organs.*—In discussing this subject, it will be convenient to consider the organs arranged in groups or systems devoted to some common functions.

α. On the Cerebro-spinal System.—Taken in small or moderate doses, opium first produces excitement of the vascular system of the brain, accompanied with corresponding excitement in the cerebro-spinal functions, as already stated. This state, however, is succeeded by that of depression. The effect of opium-eating and opium-smoking on the intellectual faculties has been already described. In large or poisonous doses the leading symptom is sopor—that is, a state analogous to profound sleep, from which the patient *can* be roused, though with difficulty. In the latter stage of poisoning this symptom is succeeded by coma—that is, profound sleep, from which the patient *cannot* be roused. Sopor is usually accompanied either with actual paralysis of the muscular fibres, or with a diminished power almost amounting to it; both of which states doubtless arise from the same condition of the cerebro-spinal system which produces sopor or coma. This state is usually supposed to be sanguineous (venous) congestion. The pupil is usually contracted,—a circumstance deserving of especial notice.

But in some cases we have delirium in the place of sopor or coma, and convulsions instead of paralysis. These are to be regarded as exceptions to the general rule, and are accounted for, pathologically, by supposing they depend on a state of irritation or excitement set up in the nervous centres, and which usually, though not invariably, terminates in congestion.

Another effect of opium is diminished sensibility. Thus the whole body becomes less susceptible of painful impressions; in dangerous and fatal cases, the eyes are insensible to light,—the ears to sound. This state has been accounted for by supposing that the functions of the sensitive nerves are diminished or suspended by the congested condition of the brain.

From these effects of opium on the cerebro-spinal system the following inferences may be drawn:

1. That it is an objectionable agent in apoplexy, phrenitis, and paralysis.
2. That under proper regulations it is a remedy which may be used to stimulate the cerebro-vascular system, to promote sleep, to diminish inordinate muscular contraction, to diminish the sensibility of the body, and thereby to alleviate pain.

β. On the Digestive System.—The usual effects of opium on the organs of digestion are the following:—It diminishes secretion and exhalation from the whole canal; thus it causes dryness of the mouth and throat, and diminishes the liquidity of the stools: it excites thirst, lessens hunger, checks the digestive process (for in some animals poisoned by opium, food which they had taken previously has been found in the stomach unchanged); and in some cases it excites vomiting. Mr. Kerr (*Med. Obs. and Inq.* vol. v. p. 321,) tells us that in the famine which prevailed in the East Indies, in the year 1770, opium was purchased by the unhappy sufferers, at extraordinary prices, to allay the cravings of hunger, and to banish the dreadful prospect of death. The Tartar couriers, who travel immense distances in a short period of time, take opium only during the journey, to support them. It diminishes the sensibility and contractility of the diges

tive organs: hence the difficulty, in severe cases of poisoning, of producing vomiting. The constipation which follows the use of opium depends partly on the same cause, and in part also on the diminished excretion of bile, and diminished secretion from the gastro-intestinal mucous membrane.—Sprœgel (quoted by Christen, *Opium hist. chem. and pharm. invest.* p. 66, 1820,) found the choledic ducts of animals, to whom opium had been given, filled with bile; yet it had not passed into the intestines, for the fæces were scarcely tinged by it, but had the same appearance which we observe them to have in jaundiced patients.

From these effects of opium on the digestive organs, we may draw the following inferences:

1. That in diminished secretion from the gastro-intestinal membrane, in extreme thirst, in loss of appetite and weak digestion, in obstinate costiveness, and in diminished excretion of bile, opium is an objectionable remedy.

2. That under proper regulations, opium is an admissible remedy for the following purposes:—To diminish excessive hunger; to allay pain, when unaccompanied by inflammation; to diminish the sensibility of the digestive organs, in cases of acrid poisoning, and in the passage of biliary calculi; to produce relaxation of the muscular fibres of the alimentary canal (in colic and diarrhœa), and of the gall ducts (in the passage of calculi), and to diminish excessive secretion from the intestinal canal, in diarrhœa.

By continued use (as by opium-eaters) this drug frequently ceases to cause dryness of the mouth, to pall the appetite, or to confine the bowels, as I have already mentioned.

γ. *On the Vascular System.*—Opium certainly influences the movements of the heart and arteries; but the effect is by no means uniform, since in some cases we see the pulse increased, in others diminished in frequency; and a like variation is noticed in its fulness. Moreover, these variations occur in the same case at different stages. From Dr. Crumpe's experiments, before referred to, it appears that, after the use of a moderate dose of opium, the frequency of the pulse is first increased, then decreased. The diameter of the artery, and the force and regularity with which the pulsations are effected, are properties of the pulse readily, but by no means uniformly, affected by opium. To a certain extent we perceive a relation between the condition of the pulse and that of the cerebro-spinal functions. Thus, when convulsions occur, we usually have a hurried pulse—whereas, when sopor or coma supervenes, the pulse becomes weaker or slower, or both, than natural. But these conditions are by no means uniform. A frequent pulse, with a feverish condition of the body, are common consequences of the use of small or moderate doses of opium; and in poisoning by this drug, a quick pulse, even though no convulsive movements are observed, is by no means rare. A poisonous dose of opium usually enfeebles the pulse, sometimes makes it fuller, often renders it irregular, and towards death always renders it feeble, and often imperceptible. We can easily believe that the muscular fibres of the heart must experience, from the use of a large dose of opium, a diminution of power in common with other muscular fibres, and hence the contractions become weaker. It is also probable that the contractile coat of the arteries and capillaries equally suffers. Now Wirtensohn (quoted by Barbier, *Traité Elém. de Mat. Méd.* t. ii. 2me éd.) supposes that the fulness of the pulse sometimes observed in poisoning by opium, arises from the insufficient power of the heart to propel the blood through this paralysed or weakened capillary system. The accumulation of blood observed in the large venous trunks and cavities of the right side of the heart, is supposed to arise from the obstruction experienced to its passage through the pulmonary vessels.

In attempting to lay down indications and contra-indications for the use of opium as a remedy for morbid conditions of the circulation, two difficulties present themselves:—*first*, the same condition of the vascular system may be induced by various and even opposite causes, for some of which opium may be an appropriate remedy, while for others it may prove an injurious agent; *secondly*, the effects of opium on the circulation are not uniform, and hence not to be relied on. The following conclusions, therefore, are submitted with considerable hesitation as to the universality of their application:

1. That in increased activity of the vascular system with considerable power, or with diminished secretions and exhalations, and in morbid conditions of the vascular system with a tendency to sopor or coma, opium is an objectionable remedy.

2. That in vascular excitement with great diminution of power, as after hemorrhage; and in various morbid conditions of the pulse attended with acute pain, spasm, or profuse secretion and exhalation, but without visceral inflammation, opium often proves a serviceable agent.

δ. *On the Respiratory System.*—In studying the effects of opium on the respiration, we must remember that the mechanical part of this function is effected by muscular agency; and as the contractility of the muscular fibre is powerfully influenced by opium, so the respiratory movements are also necessarily modified. Occasionally the primary effect is a slight increase in their frequency; but the secondary effect is almost always of an opposite kind, the respiration being slower than usual; and when coma is present, the breathing is usually gentle, so as scarcely to be perceived; but in some cases it is stertorous. In fact, a paralytic condition of the respiratory muscles takes place, in consequence of which inspiration becomes gradually more and more difficult, until eventually asphyxia is induced, which is usually the immediate cause of death.

Another effect ascribed to opium is, that it checks the arterialization of the blood, by diminishing the supply of nervous agency, without which the decarbonization or oxygenization of this fluid cannot take place. It is difficult, however, to distinguish the consequences of this effect from those of asphyxia produced by paralysis of the respiratory muscles.

The third point of view under which we have to examine the influence of opium on the respiratory system is, its effect on the membrane lining the trachea and bronchial tubes and cells. In the first place, it diminishes the sensibility of this, in common with other parts of the body; and, secondly, it checks exhalation and mucous secretion.

A knowledge of these effects of opium on the organs of respiration leads to the following conclusions:

1. That this agent is contra-indicated in difficulty of breathing arising from a deficient supply of nervous energy, as in apoplectic cases; that it is improper where the venous is imperfectly converted into arterial blood; and, lastly, that it is improper in the first stage of catarrh and peripneumony, both from its checking secretion, and from its influence over the process of arterialization.

2. That in cases of poisoning by opium, artificial respiration is indicated, to prevent asphyxia.

3. That opium may, under proper regulations, be useful to diminish the contractility of the muscles of respiration, or of the muscular fibres of the air tubes, as in spasmodic asthma; to diminish the sensibility of the bronchia, in the second stage of catarrh, and thereby to allay cough by lessening the influence of the cold air; and lastly, to counteract excessive bronchial secretion.

ε. *On the Urinary System.*—Authors are not agreed as to the effect of opium on the kidneys; some asserting that it increases, others that it diminishes, the quantity of urine secreted. Thus, Dr. Michaelis (*Med. Comm.* i. p. 307, 1784) asserts, that in giving opium in venereal cases, he has sometimes found the secretion of urine exceeding in quantity all the fluids drank. It cannot, however, be doubted, that in most cases a moderate quantity of opium diminishes the excretion, while at the same time it makes this fluid turbid and thick. This does not, however, prove the kidneys to be the part affected. Sprœgel (cited by Christen, *op. supra cit.* p. 68) tells us, that when he gave two scruples of opium to dogs, no urine was passed for two days; and, under the influence of two drachms of this medicine, the urine was retained for three days. But dissection showed that the kidneys had not ceased to secrete urine, since the bladder was found distended with this secretion, and its parietes without the least sign of contractility on the application of nitric acid; so that it would appear the non-evacuation of the urine was referrible to the insensible and paralyzed condition of the vesical coats, and not to the diminished urinary secretion. Charvet (*op. supra cit.* p. 221) has also noticed in dogs, cats, and hares, that

the urinary bladder was distended. As, however, in man opium usually increases the cutaneous exhalation, while in other mammals this effect was not observed, we must be careful in transferring our conclusions with respect to the influence of opium on one order of animals to another order. But I ought to add, that Welper, of Berlin, always found the bladder filled with urine both in man and animals. In some morbid conditions of system, opium certainly checks the urinary secretion. This is decidedly the case in diabetes. (Prout, *Inq. into the Nat. and Treat. of Affect. of the Urin. Org.* p. 74, 2d ed.)

The ureters and bladder have their sensibility and contractility diminished by opium. With respect to the effect on the first of these parts, the statement seems proved by the well-known beneficial influence of opium in cases where calculi are descending along these tubes. The acute pain is frequently relieved, and the ureters relaxed, so that large calculi are sometimes allowed to descend from the kidneys along them.

Besides the observations of Sprœgel, before referred to, we have other evidence of the paralyzing and benumbing effect of opium on the bladder. In some cases of poisoning by this substance, the bladder has been found to be unable to contract on its contents. In some other instances the sphincter of the bladder has been paralyzed, and in consequence the urine was voided involuntarily. (See *Lond. Med. and Phys. Journ.* xxviii. 80, xxxi. 193; and *Lond. Med. Rev.* for 1811, p. 371.) Barbier has also noticed the same thing, and quotes the experience of Dr. Bally to the same effect. The effect of morphia on the bladder is more marked than that of opium.

These remarks on the effect of opium on the urinary organs lead to the following conclusions:

1. That in diminished sensibility or contractility, or both, of the ureters or bladder, the use of opium is objectionable.

2. That, under proper regulations, opium may be a valuable remedy to dull the sensibility of the pelvis of the kidney, in cases of renal calculi; to allay pain and produce relaxation of the ureters when calculi are passing along these tubes; and, lastly, to diminish irritation of the bladder, whether produced by cantharides or other causes.

ζ. *On the Sexual System.* αα. *Of men.*—Opium has long been celebrated as an aphrodisiac; and we are told that the Japanese, Chinese, Indians, Persians, Egyptians, and Turks, use it as such. Among other symptoms of excitement produced by the habitual use of large doses of opium, it is not improbable that there may be a heightened condition of the venereal feelings, in consequence of an increased determination of blood to that part of the brain supposed to be devoted to the sexual function, which part the phrenologists assert to be the cerebellum. Moreover it is said to produce erection; and in support of this statement the following strange story is told:—"Turcæ ad Levenzinum, 1664, contra Comitem Lud. Souches pugnantes, opio exaltati, turpiter cæsi et octo mille numero occisi mentulas rigidas tulere." (Christen, *op. supra cit.* p. 53.) Cabanis (*Rapp. du Phys. et du Morale de l'Homme*) adopts this story, and ascribes the above-mentioned condition to the convulsive movements which affect the body *in articulo mortis*, and not to an aphrodisiac operation. The effect alluded to, if it really do take place, is probably to be referred to the accumulation of blood in the erectile tissues, arising from a disordered state of the circulation. Impotence is ascribed by some to opium-eating, and is a more probable effect. I am unacquainted with any facts on which to ground any well-founded opinion as to the power of opium to diminish or increase the spermatic secretion.

ββ. *Of Women.*—We have little positive information as to the effects of opium on the reproductive organs of women. It is said that the catamenia, lochia, and secretion of milk, are unaffected by it, but that it causes intumescence of the nipples. Under its use the milk acquires a narcotic property (see vol. i. p. 125). Furthermore, at times it has appeared to have an injurious

effect on the fœtus *in utero*. (F. H. Ramsbotham, *Lond. Med. Gaz.* vol. xiv. p. 84.) Opium appears to act on the uterus as on most other contractile parts of the body; that is, it diminishes the contractility and sensibility of this viscus.

From these observations it follows:

1. That wet nurses and pregnant women must employ opium with great caution, as its use by them may endanger the life of the child.

2. That opium may be employed to allay pain, spasm, and morbid irritation of the sexual organs in either sex; and that its use in the female is not likely to be attended with retention of the uterine or mammary secretions.

3. That the influence of opium on the venereal appetite is not sufficiently and satisfactorily determined to permit us to make any practical application of it.

η. *On the Cutaneous System.*—Considered as an organ of sense, the cutaneous system is affected by opium in an analogous way to the other organs of sense; that is, its sensibility is diminished. But the skin has another function—that of excretion, and which does not appear to be at all diminished, nay, to be increased, by the use of opium; one of the usual effects of this medicine being perspiration, which is in some cases attended with a pricking or itching of the skin, and occasionally with an eruption. In fact, taken medicinally, opium is a powerful sudorific, and often proves so even when acting as a poison. "In a fatal case, which I examined judicially," says Dr. Christison, "the sheets were completely soaked to a considerable distance round the body."

From these remarks it follows:

1. That opium is not likely to relieve loss of feeling or excessive perspiration; but may, on the other hand, under some conditions of the system, prove injurious.

2. That opium is adapted to the relief of pain or excessive sensibility of the skin, and for provoking perspiration; but the propriety of its use for these purposes must be determined by reference to the condition of the system generally. Experience proves that when the skin is very hot, and especially if it be also dry, opium is seldom beneficial, but often hurtful.

θ. *Topical effects.*—The local effects of opium are, compared with the general ones, very slight. Applied to the eye, internal membrane of the nose, urethra, cutis vera, wounds or ulcers, it first causes pain, a sense of heat, and inflammation; but these effects subside, and are followed by a weakened or a paralytic condition of the sensitive and motor nerves. Several physiologists have proved that opium causes a local paralysis of the nerves; and Muller (*Phys.* by Baly, vol. i. p. 630) has shown that the narcotic action is not propagated from the trunk of a nerve to its branches. Crumpe (*op. supra cit.*) showed, that, at the end of thirty minutes, the eye to which opium had been applied was somewhat less susceptible of the action of alcohol. Scarcely any obvious effect results from the application of opium to the ordinary integument, on account of the barrier presented by the cuticle. Employed endermically the effects are much more powerful.

Post-mortem Appearances.—The most important appearances are those observed in the nervous system; such as turgescence of vessels, effusion of water or of coagulable lymph, and occasionally, though rarely, extravasation of blood.

Whenever redness of the digestive canal is observed, I believe it is referrible to the use of some irritants (such as spirits, ammonia, or emetics) taken either with, or after the use of, opium.

Modus Operandi.—Under this head I propose to examine several points not hitherto noticed, and which involve the theory of the operation of opium on the system.

1. *The Odorous and Active Principles of Opium are absorbed.*—This assertion is proved by the following facts:

α. The odour of opium is sometimes recognisable in the secretions and exhalations: thus it is well known that the opiate odour is frequently detected in the breath of persons poisoned by this drug; and Barbier (*Traité Elem. de Mat. Méd.* ii. 732, 2de éd.) states, it may be also noticed in the urine and sweat.

β. The secretions, in some cases, appear to possess narcotic properties. Barbier mentions the case of an infant who was thrown into a state of narcotism of several hours' duration, in consequence of having sucked a nurse who had previously swallowed a dose of laudanum, to relieve a cramp of the stomach.

γ. Barruel asserts that he detected morphia in the blood and urine[1] of a person under the influence of a poisonous dose of laudanum. As, however, these results have not been obtained by Dublanc or Lassaigne, the statement is not to be absolutely relied on.

2. *The Constitutional Effects of Opium depend in great part, if not wholly, on the absorption of its active principles.*—The facts on which this assumption rests, are :

α. The active principles of opium are absorbed.

β. The constitutional effects of it are found to be proportionate to the absorbing powers of the part.

γ. The effect of opium, when thrown into the jugular vein, is similar to, though more powerful than, that produced by its application to other parts of the body.

δ. "The narcotic action does not react from a particular point of a nerve on the brain." (Muller, *Phys.* by Baly, i. 631.)

3. *The Essential and Primary Operation of Opium is on the Nervous System (the Brain and Spinal Cord chiefly).*—This axiom is proved by reference to the already-described effects of opium. An examination of them shows that—

α. The most important effects of opium are direct and obvious lesions of the nervous functions.

β. The other effects of opium appear, for the most part, to be secondary,—that is, they arise out of the nervous lesions just referred to.

4. *Opium acts on the Nervous System as an Alterative.*—There are but three kinds of changes, compatible with life, which medicines can effect in the vital actions of an organ,—viz. an increase, a diminution, or an alteration of activity. A change in the intensity or energy merely of the vital actions of the nervous system, would not give a satisfactory explanation of the effects of opium. We are obliged, therefore, to assume that opium changes the quality of the actions. This is what is meant by the term *alterative*.

The inquiry into the nature and kind of influence exercised by opium over the system, presents an extensive field for speculation and hypothesis. Galen (*De Simpl. Med. Facult.* lib. viii.) declared opium to be cold in the fourth degree, and his authority long prevailed in the schools. It was first opposed by the *iatro-chemists*, who declared opium to be of a hot nature. (Wedelius, *Opiologia*, cap. vi. p. 26, 1682.) Some, however, adopted a middle course, and asserted that it possessed both hot and cold particles. (See Crumpe, *op. supra. cit.* p. 91.) The *iatro-mechanists* endeavoured to explain the operation of opium on mechanical principles. By some expansion, by others condensation, of the blood, was supposed to be produced by the mechanical properties of the opiate particles acting on the nerves. (See an account of these opinions by Tralles, *Usus Opii*, Sect. 1, 1757.) Dr. Cullen (*Mat. Med.* ii. 225) considered opium to be a sedative, and referred its effects to its power of "diminishing the mobility, and in a certain manner suspending the motion, of the nervous fluid." Several later writers, Barbier (*Traité Elém. de Mat. Méd.* ii. 2ade éd.) for example, also calls opium a sedative. Brown (*Elementa Medicinæ*) declared it to be a stimulant, and his opinion has been adopted by Crumpe, (*op. supra cit.*) Murray, (*Syst. of Mat. Med. and Therap.*, Edinb.) and Dr. A. T. Thomson, (*Elem. of Mat. and Therap.*) in this country, and of course by the continental Brunonians, as well as by the partisans of the Italian theory of contra-stimulus. (See some remarks on the *modus operandi* of opium, by Mr. Ward, in the *Lond. Med. and Phys. Journ.* vols. vii. viii. & ix.) Fontana (*Treat. on the Venom of the Viper*, iii. 199) ascribed the operation of opium to changes which it induces in the blood. Mayer (quoted by Orfila, *Toxicol. Gén.*) declared opium to be both stimulant and sedative,—viz. stimulant to the nerves and vascular system, but sedative to the muscles and digestive organs. Lastly, Orfila (*Toxicol. Gén.*) asserts that "opium, employed in strong doses, ought not to be ranked among the narcotics or the stimulants; it exerts a peculiar mode of action which cannot be designated by any of the terms at this moment employed in the Materia Medica." These examples, selected out of many opinions, will be sufficient to prove how little is really known of the real action of opium; and I believe we shall save ourselves much time and useless speculation by at once confessing our ignorance on this point.

[1] On one occasion I at first supposed that I had detected morphia and meconic acid in the urine of a man poisoned by opium; for both nitric acid and the sesquisalts of iron gave a red colour to this secretion. I have since found, however, that the urine of healthy individuals often yields the same results.

5. *The operation of Opium, compared with that of other cerebro-spinants or narcotics, is distinguished by both positive and negative characteristics.*—The symptoms whose presence constitutes the *positive* characters, are relaxation or paralysis of the contractile tissues, a tendency to sleep or stupor, a contracted pupil, and constipation. The symptoms whose absence furnishes the *negative* characters, are tetanic convulsion, delirium or inebriation, dilated pupil, syncope, gastro-intestinal irritation, and topical numbness.

These are the general characteristics of the opiate medication. To some of them occasional, or perhaps, frequent, exceptions exist.

I have already pointed out the distinguishing effects of hyoscyamus (p. 299), belladonna (p. 304) and stramonium (p. 310). The topical numbness caused by aconite distinguishes its operation from that of opium. Moreover, in three cases of poisoning by this substance, which came under my notice, there was no stupor. Tobacco and foxglove enfeeble the vascular system, causing syncope; and they also produce gastro-intestinal irritation. Furthermore, they have not that tendency to induce sleep which we observe after the use of opium. The speedy operation, short period of influence, and, usually, the presence of convulsions, distinguish the operation of hydrocyanic acid. Indian hemp induces a cataleptic state.[1] Vinous liquids cause their well-known peculiar inebriation. Their effects in small doses agree, to a certain extent, with those of small doses of opium; but they are not equally available as antispasmodics. The peculiarities of the operation of conia have been pointed out (p. 491).

Uses.—Opium is undoubtedly the most important and valuable remedy of the whole Materia Medica. We have, for other medicines, one or more substitutes; but for opium we have none,—at least in the large majority of cases in which its peculiar and beneficial influence is required. Its good effects are not, as is the case with some valuable medicines, remote and contingent, but they are immediate, direct, and obvious; and its operation is not attended with pain or discomfort. Furthermore, it is applied, and with the greatest success, to the relief of maladies of every day's occurrence, some of which are attended with the most acute human suffering. These circumstances, with others not necessary here to enumerate, conspire to give to opium an interest not possessed by any other article of the Materia Medica.

We employ it to fulfil various indications; some of which have been already noticed. Thus we exhibit it, under certain regulations, to mitigate pain, to allay spasm, to promote sleep, to relieve nervous restlessness, to produce perspiration, and to check profuse mucous discharges from the bronchial tubes and gastro-intestinal canal. But experience has proved its value in relieving some diseases in which not one of these indications can be at all times distinctly traced.

1. *In Fevers.*—The consideration of the use of opium in fever presents peculiar difficulties. Though certain symptoms which occur in the course of this disease, are, under some circumstances, most advantageously treated by opium, yet, with one or more of these symptoms present, opium may, notwithstanding, be a very inappropriate remedy. The propriety or impropriety of its use, in such cases, must be determined by other circumstances, which, however, are exceedingly difficult to define and characterize. It should always be employed with great caution, giving it in small doses, and carefully watching its effects. The symptoms for which it has been resorted to are, *watchfulness*, *great restlessness*, *delirium*, *tremor*, and *diarrhœa*. When watchfulness and great restlessness are disproportionate, from first to last, to the disorder of the vascular system or of the constitution at large; or when these symptoms continue after excitement of the vascular system has been subdued by appropriate depletives, opium frequently proves a highly valuable remedy: nay, the safety of the patient often arises from its judicious employment.[2] The same remarks also apply to the employment of opium for the relief of delirium; but it may be added, that in patients who have been addicted to the use of spirituous liquors, the efficacy of opium in allaying delirium is greatest. Yet I have seen opium

[1] See Dr. O'Shaughnessy, *On the Prep. of the Indian Hemp*. Calc. 1839.

[2] See some interesting observations on this subject, by Dr. P. M. Latham, *Lond. Med. Gaz.* vol. x. pp. 11, 12.

fail to relieve the delirium of fever, even when given apparently under favourable circumstances; and I have known opium restore the consciousness of a delirious patient, and yet the case has terminated fatally. If the skin be damp and the tongue moist, it rarely, I think, proves injurious. The absence, however, of these favourable conditions by no means precludes the employment of opium; but its efficacy is more doubtful. Dr. Holland (*Med. Notes and Reflect.* p. 427, 2d ed. 1840,) suggests that the condition of the pupil may serve as a guide in some doubtful cases;—where it is contracted, opium being contra-indicated. A similar suggestion with respect to the use of belladonna was made by Dr. Graves (see p. 307), to which I have offered some objections. When sopor or coma supervenes in fever, the use of opium generally proves injurious. Recently the combination of opium and emetic tartar has been strongly recommended in fever with much cerebral disturbance, by Dr. Law (*Lond. Med. Gaz.* xviii. 538 and 694,) and Dr. Graves. (*Ibid.* xx. 538.)

2. *Inflammatory diseases.*—Opium has long been regarded as an objectionable remedy in inflammation; but it is one we frequently resort to, either for the purpose of palliating particular symptoms, or even as a powerful auxiliary antiphlogistic remedy. The statement of Dr. Young, (*Treatise on Opium*, p. 169, Lond. 1753,) "that opium was improper in all those diseases in which bleeding was necessary," is, therefore, by no means correct in a very considerable number of instances. The objects for which opium is usually exhibited in inflammatory diseases, are to mitigate excessive pain, to allay spasm, to relieve great restlessness, to check excessive secretion, and to act as an antiphlogistic. In employing it as an anodyne, we are to bear in mind that it is applicable to those cases only in which the pain is disproportionate to the local vascular excitement; and even then it must be employed with considerable caution; for to "stupefy the sensibility to pain, or to suspend any particular disorder of function, unless we can simultaneously lessen or remove the causes which create it, is often but to interpose a veil between our judgment and the impending danger." (Holland, *op. supra cit.* p. 424.) As an antiphlogistic, it is best given in conjunction with calomel, as recommended by Dr. R. Hamilton, of Lynn. (*Ed. Med. Comment.* ix. 191.) The practice, however, does not prove equally successful in all forms of inflammation. It is best adapted for the disease when it affects membranous parts, (see Brachet, *De l'Emploi de l'Opium dans les Phlegm. des Membr. muq. ser. et fibr.* 1828); and is much less beneficial in inflammation of the parenchymatous structure of organs. In *gastritis* and *enteritis* the use of opium has been strongly recommended by the late Dr. Armstrong. (*Trans. of the Assoc. of Apothecaries*, 1823.) After bleeding the patient to syncope, a full opiate (as 80 or 100 drops of the tincture, or three grains of soft opium) is to be administered, and if the stomach reject it, we may give it by injection. It acts on the skin, induces quiet and refreshing sleep, and prevents what is called the hemorrhagic reaction. If the urgent symptoms return when the patient awakes, the same mode of treatment is to be followed, but combining calomel with the opium. A third venesection is seldom required. In *peritonitis*, the same plan of treatment is to be adopted; but warm moist applications are on no account to be omitted. Of the great value of opiates in *puerperal fever* abundant evidence has been adduced by Dr. Ferguson. (*Essays on the most Important Diseases of Women*, Part i. 1839.) In *cystitis*, opium, preceded and accompanied by blood-letting and the warm bath, is a valuable remedy; it relieves the scalding pain, by diminishing the sensibility of this viscus to the presence of the urine, and also counteracts the spasmodic contractions. In *inflammation of the walls of the pelvis of the kidney, and also of the ureters*, especially when brought on by the presence of a calculus, opium is a most valuable remedy; it diminishes the sensibility of these parts, and prevents spasm: furthermore, it relaxes the ureters, and thereby facilitates the passage of the calculus. In *inflammation of the gall ducts*, produced by cal-

culus, opium is likewise serviceable; but, as in the last mentioned case, blood-letting and the warm bath should be employed simultaneously with it. In *inflammation of the mucous membranes*, attended with increased secretion, opium is a most valuable remedy. Thus, in *pulmonary catarrh*, when the first stage of the disease has passed by, and the mucous secretion is fully established, opium is frequently very beneficial; it diminishes the sensibility of the bronchial membrane to cold air, and thereby prevents cough. In severe forms of the disease, blood-letting ought to be premised. Given at the commencement of the disease, Dr. Holland (*op. supra cit.* p. 421,) says, that twenty or thirty drops of laudanum will often arrest it altogether. In *diarrhœa*, opium, in mild cases, is often sufficient of itself to cure the disease; it diminishes the increased muscular contractions and increased sensibility (thereby relieving pain), and at the same time checks excessive secretion. Aromatics and chalk are advantageously combined with it. In violent cases blood-letting should precede or accompany it. *Mild* or *English Cholera*, the disease which has been so long known in this country, and which consists in irritation or inflammation of the mucous lining of the stomach, is generally most successfully treated by the use of opium: two or three doses will, in slight cases, be sufficient to effect a cure. When opium fails, the hydrocyanic acid is occasionally most effective. In *dysentery*, opium can only be used beneficially in the latter stages, and then with great caution: it is best given in combination with either ipecacuanha or calomel. I have already stated that in *inflammation of the parenchymatous tissue of organs* the use of opium is less frequently beneficial, but often injurious. Thus in *inflammation of the cerebral substance* it is highly objectionable, since it increases the determination of the blood to the head, and disposes to coma. In *peripneumonia* it is for the most part injurious; partly by its increasing the febrile symptoms, partly by its diminishing the bronchial secretion, and probably also, by retarding the arterialization of the blood, and thereby increasing the general disorder of system. It must be admitted, however, that there are circumstances under which its use, in this disease, is justifiable. Thus, in acute peripneumonia, when blood-letting has been carried as far as the safety of the patient will admit, but without the subsidence of the disease, I have seen the repeated use of opium and calomel of essential service. Again: in the advanced stages of pneumonic inflammation, when the difficulty of breathing has abated, opium is sometimes beneficially employed to allay painful cough, and produce sleep. In *inflammation of the substance of the liver*, opium is seldom beneficial: it checks the excretion, if not the secretion, of bile, and increases costiveness. In *rheumatism*, opium frequently evinces its happiest effects. In acute forms of the disease it is given in combination with calomel, as recommended by Dr. R. Hamilton,—blood-letting being usually premised. From half a grain to two grains of opium should be given at a dose. Dr. Hope (*Lond. Med. Gaz.* xix. 815,) recommends gr. vij. or gr. x. of calomel to be combined with each dose of opium. It is not necessary, or even proper, in ordinary cases, to affect the mouth by the calomel; though to this statement exceptions exist. The use of mercury may even, in some cases, be objectionable; and in such, Dover's powder will be found the best form of exhibition. This plan of treatment is well adapted for the diffuse or fibrous form of acute rheumatism; but it does not prove equally successful in the synovial forms of the disease. It is also valuable in chronic rheumatism.

3. *In Diseases of the Brain and Spinal Cord.*—In some cerebro-spinal diseases great benefit arises from the use of opium; while in other cases injury only can result from its employment. The latter effect is to be expected in inflammation of the brain, and in apoplectic cases. In other words, in those cerebral maladies obviously connected with, or dependent on, an excited condition of the vascular system of the brain, opium acts injuriously. But there are many disordered conditions of the cerebro-spinal functions, the intensity of

which bears no proportion to that of the derangement of the vascular system of the brain; and there are other deviations from the healthy functions in which no change in the cerebral circulation can be detected. In these cases opium or morphia frequently evinces its happiest effects. In *insanity* its value has been properly insisted on by Dr. Seymour. (*Lond. Med. Gaz.* vol. ix. p. 114; and *Med. Chir. Trans.* vol. xix. p. 167.) He, as well as Messrs. Beverley and Phillips, employed the acetate of morphia. Its good effects were manifested rather in the low, desponding, or melancholic forms of the disease, than in the excited conditions; though I have seen great relief obtained in the latter form of the disease by full doses. Opium is sometimes employed by drunkards to relieve *intoxication*. I knew a medical man addicted to drinking, and who, for many years, was accustomed to take a large dose of laudanum whenever he was intoxicated and was called to see a patient. On one occasion, being more than ordinarily inebriated, he swallowed an excessive dose of laudanum, and died in a few hours of apoplexy.

In *delirium tremens* the efficacy of opium is almost universally admitted. Its effects, however, require to be carefully watched; for large doses of it, frequently repeated, sometimes hasten coma and other bad symptoms. If there be much fever, or evident marks of determination of blood to the head, it should be used with great caution, and ought to be preceded by loss of blood, cold applications to the head, and other antiphlogistic measures. Though opium is to be looked on as a chief remedy in this disease, yet it is not to be regarded as a specific. Dr. Law (*Lond. Med. Gaz.* xviii. 538 and 694,) speaks in high terms of its association with emetic tartar. I have before noticed the use of opium in alleviating some of the *cerebral symptoms which occur during fever*.

In *spasmodic and convulsive diseases* opium is a most important remedy. In *local spasms produced by topical irritants*, it is a most valuable agent, as I have already stated: for example, *in spasm of the gall ducts* or *of the ureters*, brought on by the presence of calculi; in *colic* and in *painful spasmodic contractions of the bladder*, or *rectum* or *uterus*. In *spasmodic stricture* opium is sometimes useful. In genuine *spasmodic asthma*, which probably depends on a spasmodic condition of the muscular fibres investing the bronchial tubes, a full dose of opium generally gives temporary relief; but the recurrence of the paroxysms is seldom influenced by opium. There are several reasons for believing that one effect of narcotics in dyspnœa is to diminish the necessity for respiration. Laennec (*Treat. on the Diseases of the Chest*, by Forbes, pp. 77 and 99, 1827,) states, that when given to relieve the extreme dyspnœa of mucous catarrh, it frequently produces a speedy but temporary cessation of the disease; and if we explore the respiration by the stethoscope, we find it the same as during the paroxysm,—a proof that the benefit obtained consists simply in a diminution of the necessity for respiration. That the necessities of the system for atmospheric air vary at different periods, and from different circumstances, is sufficiently established by the experiments of Dr. Prout, (*Ann. of Phil*, ii. 330; and iv. 331); and it appears that they are diminished during sleep, at which time, according to Dr. Edwards, (*De l'Infl. des Agens Physiq.* p. 321, 1824,) the transpiration is increased. Moreover, the phenomena of hybernating animals also bear on this point; for during their state of torpidity, or hybernation, their respiration is proportionally diminished.

In the *convulsive diseases* (*chorea*, *epilepsy* and *tetanus*,) opium has been used, but with variable success: in fact the conditions of system under which these affections occur, may be, at different times, of an opposite nature; so that a remedy which is proper in one case is often improper in another. In *tetanus*, opium was at one time a favourite remedy, and is undoubtedly at times a remedy of considerable value. But it is remarkable that the susceptibility of the system to its influence is greatly diminished during tetanus. I have already (vol. i. p. 147) referred to the enormous quantities which may, at this time, be taken with

impunity. In 128 cases of tetanus noticed by Mr. Curling, (*Treat. on Tetanus*, p. 151, 1836,) opium in various forms, and in conjunction with other remedies, was employed in eighty-four cases; and of these, forty-five recovered. Notwithstanding, however, the confidence of the profession in its efficacy is greatly diminished.

Lastly, opium occasionally proves serviceable in several forms of *headache*, especially after loss of blood. I have seen it give great relief in some cases of what are commonly termed nervous headaches; while in others, with apparently the same indications, it has proved injurious. Chomel (*Lond. Med. Gaz.* vol. i. p. 156,) applied, with good effect, opium cerate to a blistered surface of the scalp, to relieve headache.

4. *In Diseases of the Chest.*—In some affections of the heart and of the organs of respiration opium is beneficial. I have already alluded to its employment in *catarrh*, *peripneumonia*, and *spasmodic asthma*. In the first of these maladies caution is often requisite in its use. "In an aged person, for example, suffering under *chronic bronchitis* or *catarrhal influenza*—and gasping, it may be, under the difficulties of cough and expectoration—an opiate, by suspending these very struggles, may become the cause of danger and death. The effort here is needed for the recovery of free respiration; and if suppressed too long, mucus accumulates in the bronchial cells, its extrication thence becomes impossible, and breathing ceases altogether." (Holland, *op. supra cit.* p. 425.)

5. *In Maladies of the Digestive Organs.*—I have already referred to the use of opium in *gastritis*, *enteritis*, *peritonitis*, *diarrhœa*, *dysentery*, *colic*, *the passage of gall-stones* and *in hepatitis*. With respect to the use of opium in *hepatic affections*, I am disposed to think with Dr. Holland, that, with the exception of the painful passage of a gall-stone through the ducts, there is scarcely a complaint of the liver and its appendages "where opium may not be said to be hurtful, though occasionally and indirectly useful when combined with other means." (*Op. supra cit.* p. 429.) *In poisoning by acrid substances* opium is used with advantage to lessen the susceptibility of the alimentary canal, and thereby to diminish the violence of the operation of these local irritants. Cantharides, all the drastic purgatives, when taken in excessive doses, (as elaterium, colocynth, gamboge, scammony, and croton oil or seeds) and *Arum maculatum*, may be mentioned as examples of the substances alluded to. Besides the above-mentioned beneficial operation, opium allays the spasmodic contractions of the bowels, relieves pain, and checks inordinate secretion and exhalation.

In poisoning by corrosives (the strong mineral acids, and alkalis, for example,) diminishing the sensibility of the alimentary canal by the use of opium, cannot of course, alter the chemical influence of the poisons, yet it may prove useful by allaying the consequences of inflammation.

As meconic acid is said to be an antidote in cases of poisoning by corrosive sublimate, opium, in full doses, may perhaps be administered with some advantage, when other antidotes cannot be procured.

In poisoning by the preparations of arsenic, of lead, and of copper, opium is sometimes found useful.

6. *In Maladies of the Urino-genital apparatus* opium is a most valuable remedy. It mitigates pain, allays spasmodic action, checks copious mucous secretion, and diminishes irritation. Its use for one or more of these purposes in *nephritis*, *cystitis*, *the passage of urinary calculi* and *spasmodic stricture*, has been already pointed out. *In irritable bladder* it is an invaluable remedy, especially in conjunction with liquor potassæ (see vol. i. p. 478). *In irritation* and *various painful affections of the uterus*, and in *chordee*, the value of opium is well known. In the treatment of the *phosphatic diathesis* it is the only remedy that can be employed, according to Dr. Prout, to diminish the unnatural irritability of the system.

Of all remedies for that hitherto intractable malady, *diabetes*, opium has been

found to give the most relief. (See Prout, *Inq. into the Treat. of Diabetes*, &c. p. 74, 2d ed. 1825.) Under its use the specific gravity, saccharine quality, and quantity of urine, have been diminished. It has not, however, hitherto succeeded in permanently curing this disease. Dr. Prout has also found it serviceable when there is an *excess of urea in the urine*. (*Inq. into the Treat. of Diabetes*, &c. p. 54, 2d ed. 1825.)

7. *As an anodyne.*—To relieve pain by dulling the sensibility of the body, opium is, of all substances, the most useful, and the most to be relied on for internal exhibition. We sometimes use it to alleviate the pain of inflammation, as already mentioned; to diminish spasm and the sensibility of the part in calculi of the gall ducts, in the ureters, and even when in the urinary bladder; to relieve pain in the various forms of scirrhus and carcinoma, in which diseases opium is our sheet-anchor; to allay the pain arising from the presence of foreign bodies in wounds; to prevent or relieve after-pains; to diminish the pain of menstruation; and, lastly, as an anodyne in neuralgia. As a *benumber* or *topical anodyne* it is greatly inferior to aconite. Hence in neuralgia the latter is much more successful than opium. (See *Aconitum*.)

8. In *hemorrhages.*—Opium is at times serviceable to obviate certain *ill effects of hemorrhages;* as when there is great irritability attended with a small and frequent pulse, and also to relieve that painful throbbing about the head so often observed after large evacuations of blood. In or immediately after *uterine hemorrhage* the use of opium has been objected to, on the ground that it might prevent the contraction of the womb; but where the employment of opium is otherwise indicated, this theoretical objection deserves no weight. In *bronchial hemorrhage* it is at times a valuable remedy, and may be associated with acetate of lead (notwithstanding the chemical objections to the mixture) with good effect.

9. *In mortification.*—When mortification is attended with excessive pain, opium is resorted to. In that kind of mortification called *gangræna senilis*, which commences without any visible cause, by a small purple spot on the toes, heels, or other parts of the extremities, and which sometimes arises from an ossified condition of the arteries, Mr. Pott (*Chir. Obs.* 1775) strongly recommended opium, in conjunction with a stimulating plan of treatment, and experience has fully proved its great efficacy.

10. *In venereal diseases.*—Opium is frequently employed in venereal diseases to prevent the action of mercurials on the bowels during salivation; also to allay the pain of certain venereal sores, and venereal diseases of the bones. By some it has in addition been employed as an anti-venereal remedy; and, according to Michaelis (*Med. Communications*, vol. i.) and others, with success. Moreover, it is stated by Dr. Ananian, who practised at Constantinople, that those persons who were in the habit of taking opium rarely contracted the venereal disease. But opium possesses no specific anti-venereal powers. (Pearson, *Observ. on the Effects of various Art. of the Mat. Med. in Lues Ven.* p. 57, 1800.) It has appeared to me, on several occasions, to promote the healing of venereal sores.

11. In various forms of *ulcers*, and in *granulating wounds*, the efficacy of opium has been satisfactorily established by Mr. Skey.[1] Richter, (*Comm. Soc. Scient. Gött.* vol. xv.) and others, (See Ploucquet's *Lit. Med.* iv. 214, 1809,) had already noticed its good effects; but their statements had attracted little attention. Mr. Grant, (*Lond. Med. Journ.* vi. 5, and 130,) in 1785, pointed out the efficacy of opium in the treatment of foul ulcers, attended with a bad discharge, and much pain. He ascribed these symptoms to "morbid irritability," which the opium removed. Its use is prejudicial in ulcers attended with inflammation, in the florid or sanguineous temperament, and in childhood. But

[1] *On a new Method of Treatment employed in the Cure of various forms of Ulcer and Granulating Wounds.* Lond. 1837.

in the chronic or callous ulcer, in the so-called varicose ulcer, in recent ulcers (from wounds) in which granulation proceeds slowly, or in other cases, the efficacy of opium, administered in small doses, (as ten drops of laudanum three times daily), is most manifest, especially in elderly persons, and in those whose constitutions have been debilitated by disease, labour, spirituous liquors, &c. It appears to promote the most genial warmth, to give energy to the extreme arteries, and thereby to maintain an equal balance of the circulation throughout every part of the body, and to animate the dormant energies of healthy action.

12. The *external application* of opium is comparatively but little resorted to, and for two reasons: in the first place, its topical effects are slight; and, secondly, its specific effects on the brain and general system are not readily produced through the skin. Aconite and belladonna greatly exceed opium in their topical effects. The following are some of the local uses of opium:—In *ophthalmia*, the wine of opium is dropped into the eye when there is excessive pain (see *Vinum Opii*). In *painful and foul sores*, opiates are used with occasional good effects. Mr. Grant (*op. supra cit.*) applied the tincture twice a-day, in an oatmeal poultice, to irritable sores. Opiate *frictions* have been employed as topical anodynes, and to affect the general system. Thus, in *chronic rheumatisms and sprains*, the opium liniment proves a useful application. In *maniacal delirium*, as well as some other cerebral disorders, Mr. Ward (*Med. and Phys. Journ.* vol. i. p. 440, 1799) employed, with apparently beneficial effects, opiate frictions; for example, ʒss. of opium, mixed with gr. iv. of camphor, ℈iv. of lard, and ʒj. of olive oil. In *neuralgic affections*, an opiate cerate, or finely powdered hydrochlorate of morphia, applied to a blistered surface, occasionally gives relief. In *gastrodynia*, it may be applied in the same way to the epigastrium (Holland). In *gonorrhœa and gleet*, opium injections have been used. In *spasmodic stricture*, *diseases of the prostate gland*, and in *gonorrhœa to prevent chordee*, an opiate suppository is a useful form of employing opium, especially where it is apt to disagree with the stomach. In *nervous and spasmodic affections* (as some forms of asthma), the endermic application of opium or morphia, applied along the course of the spine, is often singularly beneficial, when all methods of depletion and counter-irritation have proved utterly unavailing (Holland). In *toothache*, opium is applied to the hollow of a carious tooth. Dr. Bow (*Lancet*, March 18, 1837) speaks in the highest terms of the efficacy of the external application of opium *in inflammatory diseases*, but especially *bronchitis* and *croup*.

Administration.—Opium is given, *in substance*, in the form of pill, powder, lozenge, or electuary. The dose is subject to great variation, depending on the age and habits of the patient, the nature of the disease, and the particular object for which we wish to employ it. In a general way, we consider from an eighth of a grain to half a grain a *small dose* for an adult. We give it to this extent in persons unaccustomed to its use, when we require its stimulant effects, and in mild catarrhs and diarrhœas. From half a grain to two grains we term *a medium dose*, and employ it in this quantity as an ordinary anodyne and soporific. From two to five grains we denominate *a full* or *large dose*, and give it to relieve excessive pain, violent spasm, in some inflammatory diseases after blood-letting, in tetanus, &c. These are by no means to be regarded as the limits of the use of opium. *Opium pills* (*pilulæ opii*) may be prepared either with crude or powdered opium. The latter has the advantage of a more speedy operation, in consequence of its more ready solution in the gastric liquor. Employed as *a suppository*, opium is used in larger doses than when given by the stomach. Five grains, made into a cylindrical mass with soap, may be introduced into the rectum, to allay irritation in the urino-genital organs.

Antidotes.—In a case of poisoning by opium, the first indication is to remove the poison from the stomach, the second is to neutralize any of it which may be retained in the system, and the third is to obviate its injurious effects.

1. Use of evacuants.—Until other and more powerful evacuant means can be obtained, we should have recourse to tickling the throat with the fingers, or with a feather dipped in oil. As domestic emetics, mustard or salt may be exhibited. A dessert-spoonful of flour of mustard, or a table-spoonful of salt, may be taken, stirred up in a tumblerful of water. The stomach-pump is, however, the best means of evacuating the contents of the stomach, and when it can be procured, should always be preferred. The emetics usually resorted to are the sulphates of zinc and copper: the first is preferred. It should be given in doses of from one to two scruples. The dose of sulphate of copper is less,—from five grains to fifteen. Ipecacuanha or tartar emetic may be resorted to when the other means are not at hand. Clysters, containing fifteen or twenty grains of tartar emetic, may be administered; or, in extreme cases, a solution of one or two grains of this salt may be injected into the veins, taking care to prevent the introduction of air.

2. Use of chemical antidotes.—There are no known agents which completely destroy the activity of opium by their chemical properties, and which can be resorted to in these cases. Infusion of galls, however, is regarded as the best, though an imperfect antidote. Magnesia, as well as iodine and chlorine, have also been recommended.

3. Use of therapeutical means to obviate the effects.—The following are the principal means which have been found efficacious:

α. *Rousing the patient*, by exercising him up and down a room between two men. It may sometimes be necessary to continue this for several hours. β. *Cold affusion.*—Dashing cold water over the head and chest is an exceedingly valuable agent. It oftentimes assists the operation of emetics. Dr. Boisragon (*Lond. Med. Gaz.* March 6, 1840) recommends the alternation of impression, with hot or cold water, and at different parts of the surface of the body. γ. *Irritants.*—The application of irritants to the body is also sometimes a useful practice: thus blisters and sinapisms to the feet. δ. *Venesection.*—Blood-letting is sometimes necessary; but it can be only safely practised after the opium has been withdrawn from the stomach. Orfila says, that under these circumstances it never increases, but in most cases materially relieves the symptoms. ε. *Stimulants.*—Ammonia, camphor, musk, coffee, and other stimulants, are sometimes used with advantage. ζ. *Vegetable acids.*—Orfila has found the vegetable acids to be the best anti-narcotics. For this purpose, drinks of vinegar and water, lemon juice, or cream of tartar and water, should be given every ten minutes. These agents, however, should not be resorted to till the poison has been evacuated from the stomach. η. *Artificial Respiration.*—As a last resource this is on no account to be omitted. Death has on several occasions been apparently averted by it. An interesting case, in which it was successfully practised, was published many years ago by Mr. Whately. (*Med. Obs. and Inq.* vi. 331.) Natural respiration was extinct when it was begun. In another successful case, related by Mr. Smith, (*Med. Chir. Trans.* xx. 86,) artificial respiration was kept up for four hours and a half (with an interval of an hour). When it was commenced there was no pulse at the wrist, and only a slight irregular action of the heart, indicative that life was not quite extinct. A third case, also successful, is that of an infant ten days old, who had taken twenty-five or thirty drops of laudanum intended for the mother, and had lost the power of deglutition, was comatose, and had several convulsions. Artificial respiration was sustained for two or three hours. (*United States Dispensatory.*)

Preparations.—In noticing the preparations of the poppy employed in medicine, I shall arrange them under three heads:—1st, Preparations of poppy heads; 2dly, of opium; 3dly, of morphia.

a. *Preparations of Poppy Heads.*

1. DECOCTUM PAPAVERIS, L. E. D.; *Decoction of Poppy; Poppy Fomentation.*—(Poppy heads, sliced, ʒiv.; Water, Oiv. [Oiij. *E.*; Oij. *wine measure*, *D.*]

Boil for a quarter of an hour, and strain.)—The seeds contribute, by their oleaginous properties, to the emollient quality of the decoction. This preparation forms a common fomentation, which is applied to bruised, inflamed, excoriated, tender, or swollen parts; to the eye in ophthalmia, to the abdomen in enteritis, peritonitis, &c. to tender ulcers, &c. In cancer and other painful affections of the uterus, it is thrown into the vagina as a soothing remedy.

2. SYRUPUS PAPAVERIS, L. E. D.; *Syrup of White Poppies.* (Poppy heads [without the seeds, *E.;* dried, bruised, and deprived of seeds, *D.*] lb. iij. [lb. jss. *E.;* ʒxvij. *D.*]; Sugar [pure, *E. D.*], lb. v. [lb. iij. *E.;* ʒxxix. *D.*]; Boiling Water, *Cong.* v. [Oxv. *E.; Cong.* ii. *wine-measure, D.*] Boil down the capsules in the water to two gallons, and strongly express the liquor while hot. Again boil down the strained liquor to four pints and filter while hot. Set it by for 12 hours that the dregs may subside; then boil down the clear liquid to two pints, add the sugar and dissolve it, *L.*—Both the *Edinburgh* and *Dublin Pharmacopœias* direct the poppy heads to be first macerated in water for some [twelve, *E.;* twenty-four, *D.*], hours. Then boil down [to five pints *E.* two pints, *D.*], and strain [while hot, *D.* and express strongly through calico, *E.*] Again boil [the defæcated liquor, *D.*] down [to Oij. *E.;* Oj. *D.*], add the sugar, and dissolve it with the aid of heat.)—Syrup of poppies, especially if too thin, is very liable to ferment, and then contains spirit or acetic acid, or both, and is of course ill adapted for medicinal use. To check these changes, it should be carefully made according to the directions of the College, taking care that it has the proper consistence, and keeping it in a cool place. Occasionally a mixture of treacle and laudanum, or of syrup and extract of poppies, has been substituted; but this fraud is highly dangerous, and has on several occasions proved fatal to children.[1] Syrup of poppies is narcotic, sedative, and anodyne, and is commonly employed as the infant's opiate. It mitigates pain, allays spasm and troublesome cough, and promotes sleep. Even in the adult it is sometimes used for these purposes. It forms a useful adjunct to pectoral tinctures. Over ordinary opiates it has the advantages of a less disagreeable taste, and the supposed one of being less likely to create nausea and headache. Even when properly prepared its administration to infants requires the greatest caution, on account of their known susceptibility to the influence of opiates. "I have been informed," says Dr. Montgomery, "of more than one instance in which a teaspoonful has been known to prove fatal to a healthy child."—The dose of it, for an infant of three or four months old, is fʒss.; for adults from fʒij. to fʒiv.

3. EXTRACTUM PAPAVERIS, L. E.; *Extract of Poppy.* (Poppy heads, without the seeds, bruised, ʒxv.; Boiling [distilled, *L.*] Water, *Cong.* j. Macerate for twenty-four hours; then boil down to four pints, and filter the liquor while hot: lastly, evaporate to a proper consistence, [by the vapour-bath, *E.*])—Anodyne and soporific. It appears to me to produce effects similar to those of opium, for which it is frequently substituted, on the supposition that, while it allays pain and promotes sleep, it is less liable to occasion nausea, constipation, headache, or delirium. If it be prepared from a decoction, instead of an infusion of the poppy heads as directed in the pharmacopœias, it will contain a considerable quantity of inert mucilaginous matter.—Dose, gr. ij. to ℈j.

b. *Preparations of Opium.*

1. PILULÆ OPII *sive* THEBAICÆ, E.; *Opiate Pills.* (Opium, *one part;* Sulphate of Potash, *three parts;* Conserve of Red Roses, *one part:* beat them into a proper mass, which is to be divided into five-grain pills.—It is to be observed that this pill contains twice as much opium as the opiate pill of the last Latin edition of this pharmacopœia, *E.;*)—Employed as an anodyne and soporific.—Dose, one or two pills (*i. e.* gr. v. to gr. x). The sulphate of potash serves to divide the opium. One pill of five grains contains one grain of opium.

2. PILULÆ SAPONIS COMPOSITÆ, L. (U. S.) *Pilulæ Saponis cum Opio,* D. *Com-*

[1] See the cases referred to by Dr. Montgomery in his *Obs. on the Dublin Pharm.* 472.

pound Soap Pills. (Hard Opium, powdered, ʒss.; Hard Soap, ʒij. Beat them together until incorporated.)—Employed as an anodyne and soporific.—Dose, gr. iij. to gr. x. Five grains contain one grain of opium. The soap enables the pills to dissolve readily in the juices of the stomach. From gr. v. to ℈j. are sometimes used as a suppository.

[3. PILULÆ OPII, U. S. *Pills of Opium.* Opium in powder, a drachm; soap, twelve grains. Beat with water so as to form a mass, to be divided into sixty pills. Dose one pill.]

4. PILULÆ CALOMELANOS ET OPII, E. See vol. i. p. 617.

5. PILULÆ PLUMBI OPIATÆ, E. See vol. i. p. 666.

6. TROCHISCI OPII, E.; *Opium Lozenges.* (Opium, ʒij.; Tincture of Tolu, ʒss.; Pure Sugar, in fine powder, ʒvi.; Powder of Gum-Arabic, and Extract of Liquorice, softened with boiling water, of each ʒv. Reduce the opium to a fluid extract by the formula [given for extract of opium]; mix it intimately with the liquorice previously reduced to the consistence of treacle; add the tincture; sprinkle the gum and sugar into the mixture, and beat it into a proper mass, which is to be divided into lozenges of ten grains.)—In London the manufacture of lozenges is practised as a distinct trade. The opium lozenges of the shops usually contain each about one-eighth of a grain of opium. Lozenge-makers employ a much smaller proportion of gum. The tincture of tolu, which they use, is much more concentrated than that of the shops, the spirit of which is objectionable. Opium lozenges are used to allay troublesome cough.

7. PULVIS CRETÆ COMPOSITUS CUM OPIO, L. D. *Pulvis Cretæ opiatus*, E. *Compound Powder of Chalk with Opium.*—(Compound Powder of Chalk, ʒvjss. [ʒvj. *E.*]; Powder of hard Opium, ℈iv. Triturate them together thoroughly.)—Astringent and narcotic. Employed in diarrhœa.—Dose for adults, ℈j. to ℈ij.; for children, grs. ij. to grs. x. according to their age. Forty grains of this powder, prepared according to the London or Dublin Pharmacopœia, or thirty-seven of the Edinburgh Pharmacopœia, contain one grain of opium.

8. CONFECTIO OPII, L. D. (U. S.); *Electuarium Opii*, E.; *Confection of Opium; Philonium*[1] *Londinense; Philonium Romanum.* (Hard Opium, powdered, ʒvj.; Long Pepper, ʒj.; Ginger, ʒij.; Caraway, ʒiij.; Tragacanth, powdered, ʒij.; Syrup, fʒxvj. [lb. j. *D.*] Rub the opium with the syrup previously heated, then add the other ingredients in powder, and mix, *D.*—The *London College* directs the dry ingredients to be kept mixed in the form of a very fine powder, and the syrup to be added when the confection is to be used. The *Edinburgh College* adopts the following formula:—"Aromatic Powder, ʒvj.; Senega, in fine powder, ʒiij.; Opium diffused in a little Sherry, ʒss.; Syrup of Ginger, lb. j. Mix them together, and beat into an electuary.")—Aromatic and narcotic. Employed in flatulent colic and diarrhœa; in the latter complaint usually as an adjunct to the chalk mixture.—Dose, gr. x. to ʒj.—The *Dublin* preparation contains gr. j. of opium in about twenty-five grains of confection. The *London* preparation is somewhat weaker, and contains gr. j. of opium in perhaps thirty-six grains. The *Edinburgh* preparation is still weaker; forty-three grains of it containing about one grain of opium.

[The U. S. P. directs Opium in powder, four drachms and a half; Aromatic

[1] The ancient philonium was a famous electuary of the opiate kind. It was called Philo's antidote, after Philo, of Tarsus, its inventor, who lived, it is supposed, in Augustus's time. The composition of the Philonium, described in Greek elegiac verses, is preserved and explained by Galen, *De med comp. sec. loc.* lib. ix. 4. The terms of the recipe are enigmatical, and may amuse some readers; we give the substance:—"Take of the yellow and fragrant hair of the divine Crocus, whose blood glitters in the fields of Mercury, as many drachms as a man has senses; of the Eubœan Nauplian, a drachm; of the slayer of Menœtiades, as preserved in the bowels of sheep, the like quantity; add twenty drachms of white flame, and twenty of the bean of the wild animal of Arcadia; a drachm of the root (falsely so called) which grows in the land famous for the Pisæan Jove; take twice five drachms of πῖαρ, written with the masculine article prefixed; and mingle all with the production of the daughters of the bulls of Athens." Galen interprets this curious medico-poetical farrago, which, without his aid, would certainly be not a little obscure, as implying the admixture of saffron, pyrethrum, euphorbium, white pepper, hyoscyamus, spikenard, opium, and Athenian honey. It is, moreover, stated in the verses, that the pains for which this μέγα ἔυφραμα was most serviceable were those of colic, of the liver, dysuria, and stone.—(Dr. Wm. Cummin, *Lond. Med. Gaz.* vol. xvii. p. 990.)

Powder, six ounces; Clarified Honey, fourteen ounces. Rub the Opium with the Aromatic Powder; then add the Honey, and beat them together until thoroughly mixed. About 36 grains contains one of opium.]

9. EMPLASTRUM OPII, L. E. D. (U. S.) *Plaster of Opium.* (Hard Opium, powdered, ʒss.; Resin of the Spruce Fir, powdered, ʒiij.; Plaster of Lead, lb. j.; Water, fʒviij. Add the Resin of the Spruce Fir, the Opium, and the Water, to the melted Plaster, and with a slow fire boil down until all unite into a proper consistence, *L.*—The *Edinburgh* and *Dublin Colleges* omit the water, and, for the Resin of Spruce Fir, substitute Burgundy Pitch.)—[The U. S. P. directs Opium in powder, two ounces; Burgundy Pitch, three ounces; Lead Plaster, a pound; Boiling Water, four fluid ounces. The process is similar to the above.]—Employed as a topical anodyne in rheumatism, lumbago, and neuralgia. Its powers are very light, or even equivocal.

10. EXTRACTUM OPII PURIFICATUM, L. *Extractum Opii*, E. *Extractum Opii aquosum*, D. *Purified Extract of Opium.* (Opium sliced, ʒxx. [Oj. *E.*; ʒij. *D.*]: Water [distilled, *L.*; boiling, *D.*], *Conj.* j. [Ov. *E.*; ʒij. Oj. *D.*] Add a little water to the opium, and macerate for twelve hours, that it may soften; then, the remaining water being poured in gradually, rub them until they are very well mixed, and set by, that the dregs may subside; afterwards strain the liquor, and evaporate to a proper consistence, *L.*—The *Edinburgh College* digests five times successively; each time in a pint of water, and for twenty-four hours each time. Filter the successive infusions as they are made, passing them through the same filter; unite and evaporate them in the vapour bath to the due consistence.—The *Dublin College* exposes the infusion to the air for two days before evaporation.)—When opium is digested in water, this fluid takes up the *odorous principle*, the *salts of morphia and codeia*, the *narcotina*, the *gum*, the *extractive*, and some of the *resin*. A portion of morphia is frequently found in the dregs. Moreover, a portion of the *oil* is found in the solution. By concentration, the odorous principle is dissipated, and the resin and the oil combined with, and in part saturating the narcotina, are separated. These matters would be more completely got rid of by redissolving the extract in water. The removal of these inert principles, as well as the impurities of opium and the consequent concentration of the active constituents of this substance, must, of course, render the extract a more powerful preparation than ordinary opium. Good opium yields more than half its weight (from 60 to 70 per cent.) of extract, which, therefore, should be at least one-third more active than crude opium. It is usually believed to operate with less disturbance to the general system than the ordinary preparations of opium. It is employed as an anodyne, sedative, and soporific, in cases where crude opium or its tincture disagrees.—The dose of it is from gr. $\frac{1}{4}$ to gr. iij. or gr. iv.

Liquor Opii Sedativus.—Mr. Battley, some years since, assured me that the only ingredients employed in the preparation of his *liquor opii sedativus* were opium, water, and heat. It appears to contain somewhat less meconic acid than the ordinary tincture of opium. Probably this and some other principles of opium are got rid of by successive evaporations and solutions. Perhaps an aqueous solution of the watery extract of opium, with the addition of a little spirit to preserve it, would be a convenient substitute.

11. TINCTURA OPII, L. E. D. (U. S.) *Tincture of Opium; Laudanum.* (Hard Opium, powdered, ʒiij.; Proof[1] Spirit, Oij. Macerate for fourteen days, and filter, *L.*—The proportions used by the *Dublin College* are ʒx. of Opium and Oj. [*wine measure*] of spirit. The *Edinburgh College* directs—"Opium sliced, ʒiij.; Rectified Spirit, Oj. and fʒvij.; Water, fʒxiijss. Digest the opium in the water at a temperature near 212° for two hours; break down the opium with the hand; strain and express the infusion; macerate the residuum in the rectified spirit for about twenty hours, and then strain and express very strongly. Mix the watery and spirituous infusions, and filter.—This tincture is not easily

[1] The London Pharmacopœia erroneously directs *rectified* spirit.

obtained by the process of percolation; but when the opium is of fine quality, it may be prepared thus:—Slice the opium finely; mix the spirit and water; let the opium macerate in fourteen fluidounces of the mixture for twelve hours, and then break it down thoroughly with the hand; pour the whole pulpy mass and fluid into a percolator, and let the fluid part pass through, add the rest of the spirit without packing the opium in the cylinder, and continue the process of percolation till two pints are obtained," *E.*)—The percolation process of the Edinburgh College is unnecessary and troublesome, and will, I suspect, be rarely, if ever, adopted by laudanum preparers. (Opium in powder, two ounces and a half; Diluted Alcohol, two pints. Macerate for fourteen days, express, and filter through paper, U. S.) Tincture of opium is of a deep brownish red colour, with the peculiar odour and taste of opium. Its sp. gr., according to Mr. Phillips, (*Transl. of the Pharm.*,) is 0·952. Nineteen minims of it contain about one grain of opium. Proof spirit dissolves the same constituents as water does (see p. 713), but it takes up a large proportion of narcotina, resin, and oil. I have repeatedly prepared morphia from the insoluble residue left behind in the preparation of the tincture. Tincture of opium is a powerful and valuable anodyne and soporific. Its employment is to be preferred to that of solid opium where a more immediate effect is required. Moreover, in administering opiates to children, the facility of adjusting small doses of it presents a great advantage over solid opium.—The dose of it, like that of solid opium, must vary according to several circumstances. For an adult it varies from ♏x. to f℥j. To children it must be given with the greatest caution. I have seen a powerful effect produced in a very young infant by one drop.

[12. TINCTURA OPII ACETATA, U. S. *Acetated Tincture of Opium.* (Take of Opium, two ounces; Vinegar, twelve fluidounces; Alcohol, half a pint. Rub the opium with the vinegar; then add the alcohol, and having macerated for fourteen days, express and filter through paper.) This preparation was introduced into the pharmacopœia as a substitutefor *Black Drop.* The dose is ♏x.

13. TINCTURA OPII CAMPHORATA, U. S. *Camphorated Tincture of Opium. Paregoric Elixir.* (The formula for this preparation of the British Colleges has been given at page 251, under the name of *Tinctura Camphoræ Composita.* That of the U. S. P. is Opium in powder, Benzoic Acid, each a drachm; Oil of Anise, a fluid drachm; Clarified Honey, two ounces; Camphor, two scruples; Diluted Alcohol, two pints. Macerate for fourteen days, and filter through paper. About two grains of opium are contained in the ounce. For its uses, see p. 251.)]

14. ENEMA OPII, L. D. *Enema Opii* vel *Anodynum*, E. *Opium Clyster.* (Decoction of Starch, f℥iv.; Tincture of Opium, ♏xxx. Mix, *L.*—The *Dublin College* employs ℥vi. of water instead of the Starch Mucilage, and f℥j. of Tincture of Opium.—The *Edinburgh College* uses ℥ss. of Starch; f℥ss. to f℥j. of Tincture of Opium; and f℥ij. of Water. The starch is boiled in the water, and the tincture added when the mucilage is cool enough for use.)—The formula of the London College is, in my opinion, to be preferred to those of the other British colleges; but it may be sometimes necessary to double or treble the quantity of tincture employed. In the passage of renal calculi, in nephritis, irritation or inflammation of the bladder, uterus, or prostate gland, in dysentery, and painful affections of the large intestine, the opium clyster is most valuable.

15. LINIMENTUM OPII, L. E. *Linimentum Saponis cum Opio* vel *Linimentum Anodynum*, D.; *Liniment of Opium.* (Soap Liniment, f℥vj. [by measure four parts, *D.*]; Tincture of Opium, f℥ij. [by measure three parts, *D.*] Mix, *L.*—Castile Soap, ℥vj.; Opium, ℥iss.; Camphor, ℥iij.; Oil of Rosemary, f℥vj.; Rectified Spirit, Oij. Macerate the soap and opium in the spirit for three days; filter, add the oil and camphor, and agitate briskly, *E.*)—Employed as an anodyne in rheumatism, neuralgic pains, sprains, &c.

16. VINUM OPII, L. E. D. (U. S.) *Laudanum Liquidum Sydenhami*, Ph.

L. 1720. *Tinctura Thebaica*, Ph. L. 1745. *Wine of Opium.* (Opium, ʒiij. *E.* [ʒj. *D.*; Purified Extract of Opium, ʒijss. *L.*]; [ʒij. U. S.]; Cinnamon, bruised; Cloves, bruised, of each, ʒiiss. [ʒss. *D.*] [ʒj. U. S.]; Sherry Wine, Oij. [Oj. *wine-measure*, D.] [Wine, Oj. U. S.] Macerate for fourteen [seven, *E.*; eight, *D.*] days, and filter.)—Its effects are similar to those of the tincture of opium, but its taste and smell are more agreeable. It was recommended by Mr. Ware (*Remarks on Ophthalmy*, p. 29, 1780) as an application to the eye in ophthalmia; and experience has fully proved its efficacy where there is much scalding pain, lachrymation, and intolerance of light. When first applied it causes a sharp pain and a copious flow of tears, but these effects soon subside, and are followed by a considerable abatement of the former sufferings.—For internal use the dose is gtt. x. to ſʒj.

17. TINCTURA OPII AMMONIATA, E. *Ammoniated Tincture of Opium.* (Benzoic Acid; and Saffron, chopped, ʒvj. of each; Opium, sliced, ʒss.; Oil of Anise, ʒj.; Spirit of Ammonia, Oij.; Digest for seven days, and filter.)—Employed as a powerful diffusible stimulant and antispasmodic in hooping-cough and other spasmodic affections. Each drachm and a quarter contains about a grain of opium.—Dose, ſʒss. to ſʒj.

18. ACETUM OPII, E. D. (U. S.) *Vinegar of Opium.* (Opium, ʒiv.; Distilled Vinegar, ſʒxvj. "Cut the Opium into small fragments, triturate it into a pulp with a little of the vinegar, add the rest of the vinegar, macerate in a closed vessel for seven days, and agitate occasionally. Then strain and express strongly, and filter the liquors.")—Vinegar dissolves all the principles of opium soluble in water, and is better adapted for holding in solution the narcotina and the resinous matter of opium. It cannot, of course, effect any change in the meconate of morphia contained in opium. Whether any acetate of morphia is formed at the expense of the meconate of morphia has not been satisfactorily proved. The effects of vinegar of opium do not appear to be precisely those of ordinary opium. It is believed to possess the anodyne, sedative, and soporific qualities of opium, without being apt to excite the disagreeable effects (nausea, headache, constipation, and general disorder of system,) which sometimes result from the ordinary preparation of this drug. Hill (*Hist. of the Mat. Med.* p. 784, 1751) says that Le Mort observed a very odd effect from this preparation, "which was, that it often brought on suppressions of urine." Dr. Montgomery (*Observ. on the Dubl. Pharm.* p. 451, 1830) has seen one instance of this effect; and Dr. Thomas Beattie (*Dubl. Hosp. Rep.* vol. v. p. 185) has remarked the same result from the *Black Drop*. This paralyzing effect on the bladder is doubtless referrible to the morphia, which seems to acquire, in this preparation, increased activity. Vinegar of opium is employed as an anodyne, sedative, and soporific. Dr. Montgomery observes, that he has found this preparation of opium decidedly superior to every other in relieving the agony of cancer uteri, and procuring rest at night." The same authority states, that twenty drops are equivalent to thirty of the common tincture of opium.—Dose, gtt. vi. to gtt. xxx.

Black Drop.—*Acetum Opii* may be regarded as the officinal substitute for a celebrated quack medicine called the *Black Drop*, or *The Lancaster*, or *Quaker's Black Drop*, the method of preparing which has been described by the late Dr. Armstrong. In this preparation *verjuice* (juice of the wild crab) is employed instead of vinegar. But there are several sources of uncertainty in the process.

[The U. S. Pharmacopœia directs Black Drop (*Acetum Opii*, U. S.) to be prepared as follows: Take Opium in coarse powder, eight ounces; Nutmeg in coarse powder, an ounce and a half; Saffron, half an ounce; Sugar, twelve ounces; Distilled Vinegar, a sufficient quantity. Digest the Opium, Nutmeg, and Saffron with a pint and a half of Distilled Vinegar, on a sand-bath, with a gentle heat, for forty-eight hours, and strain. Digest the residue with an equal quantity of Distilled Vinegar in the same manner for twenty-four hours. Then put the whole into a percolator and pass and repass until the liquid is clear. When filtration ceases, pour on Distilled Vinegar to make three pints. Lastly, add the Sugar by means of a water-bath, evaporate to three pints, and four fluidounces.—Dose, ɱx.]

Dr. Porter's *solution of opium in citric acid* has never come into general use.

19. UNGUENTUM GALLÆ COMPOSITUM. See p. 193.

20. PILULÆ STYRACIS COMPOSITÆ. See p. 377.

21. PULVIS IPECACUANHÆ COMPOSITUS. See p. 455.

22. PILULÆ IPECACUANHÆ COMPOSITÆ. See p. 456.

23. PULVIS KINO COMPOSITUS. See p. 567.

24. ELECTUARIUM CATECHU. See p. 578.

c. *Morphia and its Preparations.*

1. MORPHIA, L. (U. S.) *Morphia*, *Morphine*, *Morphium*.—So called from *Morpheus*, the god of sleep. Wedelius, Fr. Hoffman, and Neumann, speak of a *crystalline salt* obtained from a solution of opium; but they formed no correct notions of its nature. The *magistery of opium*, noticed by Ludwig, in 1688, may, perhaps, have been morphia.

Morphia is peculiar to the poppy tribe. It exists in opium in combination with meconic and sulphuric acids. Doubts, indeed, have been expressed with respect to its existence in opium, some chemists have suggested that it was a *product* rather than *educt;* but the accuracy of these views has been satisfactorily disproved.

The following are the directions for preparing morphia, given in the *London Pharmacopœia*.

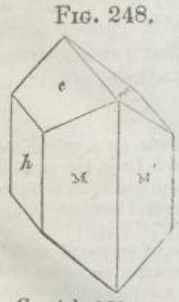
Take of Hydrochlorate of Morphia, ℥j; Solution of Ammonia, f℥v.; Distilled Water, Oj. Add the hydrochlorate of Morphia, first dissolved in a pint of water, to the solution of ammonia with an ounce of water, shaking them together. What is thrown down wash with distilled water, and dry it with a gentle heat.

[The U. S. Pharmacopœia adopts a method recommended several years ago by Dr. Staples of Philadelphia. The formula is:—Take of Opium, sliced, a pound; Distilled Water, Alcohol, each a sufficient quantity; Solution of Ammonia, six fluidounces. The Opium is to be macerated and worked with the water. The infusion evaporated to six pints and filtered, then five pints of Alcohol are to be added, and three fluidounces of Solution of Ammonia mixed with half a pint of Alcohol. Twenty-four hours afterwards the remainder of the Ammonia and the same quantity of Alcohol are to be added. By rest the crystals deposit. The Alcohol serves the purpose of suspending the colouring principles of the Opium, and renders the crystals purer. To purify them they may be dissolved in hot alcohol and filtered through animal charcoal.—J. C.]

In this process the ammonia unites with the hydrochloric acid, and the morphia being set free is precipitated.

Pure morphia presents itself under the form of transparent crystals, whose primary form is the right rhombic prism. On turmeric paper, as well as on reddened litmus paper, morphia has an alkaline reaction. Notwithstanding that it is insoluble, or nearly so, in cold water, it has a distinctly bitter taste. Boiling water dissolves a little more than one-hundredth part of morphia. It dissolves in 40 parts of cold anhydrous alcohol, and 30 parts of boiling alcohol: but it is insoluble, or nearly so, in ether. It is soluble in the oils (fixed and volatile), in solutions of potash and soda, and also, but in much smaller quantity, in solution of ammonia: lastly, it readily dissolves in sulphuric, hydrochloric, and acetic acids. When heated, the crystals lose their transparency and water of crystallization; a strong heat causes them to enter into fusion, in which state they form a yellow liquid similar to melted sulphur, and which becomes white and crystalline on cooling. Heated in the open air, it burns like resin, and leaves a carbonaceous residuum.

FIG. 248.



Crystal of Morphia.

The following are the chief *characteristics* of morphia:

1st. *Nitric acid* reddens morphia and its salts (the chlorate excepted, according to Dumas), and forms with them an orange-red solution, which is much darkened by excess of ammonia, and which becomes yellow after a little time. By the prolonged digestion of morphia in nitric acid, we obtain oxalic acid.—*Fallacies.* Nitric acid produces a red colour with several other bodies, as brucia, commercial strychnia, several volatile oils (as oil of pimento and oil of cloves), some resinous substances, infusion of cloves or of pimento, &c.

2nd. *Iodic acid* is deoxidized by morphia, iodine being set free. Hence, when this alkali is added to a solution of iodic acid, the liquor becomes reddish brown, and forms a blue compound (*iodide of starch*) with starch.—*Fallacies.* Sulphuretted hydrogen, sulphurous acid, phosphorous acids, and some other agents, have a similar effect on iodic acid.

3dly. *Sesquichloride of iron* dropped on crystals of morphia renders them blue. The same effect is produced on the acetate and oxalate, and slightly on the sulphate of morphia. No obvious effect is produced on the hydrochlorate of morphia until an alkali is added. The nature of the blue compound is not perfectly understood. Possibly, part of the morphia is oxidized, and the compound thus produced, unites with oxide of iron (*morphite of iron*). If water in excess, or acids, or alkalis, be added to the blue compound, the colour is destroyed.—*Fallacies.* Tannic and gallic acids with a little water, and infusion of cloves or of pimento, also form blue compounds with sesquichloride of iron.

4thly. The *alkaline carbonates* occasion a white precipitate (*carbonate of morphia*) in solutions of the soluble morphitic salts.

5thly. *Solution of ammonia* precipitates morphia from its solution in acids. A considerable excess of ammonia redissolves the precipitate. In very dilute solutions, ammonia occasions no precipitate until heat be applied to drive off the excess of alkali.

6thly. *Infusion of nutgalls* or a *solution of tannic acid*, causes a precipitate (*tannate of morphia*) in neutral solutions of the morphitic salts. The precipitate is soluble in acetic acid.

7thly. An alcoholic solution of *carbazotic acid* causes no precipitate in an alcoholic solution of morphia.

8thly. If a solution of *chlorine* be mixed with a solution of morphia, or its salts, and then ammonia added, a dark brown colour is developed.

The *composition* of morphia is, according to Regnault, (*Pharmaceutisches Central Blatt für* 1838, S. 486,) as follows:

	Atoms.	*Eq. Wt.*	*Per Cent.*
Carbon	35	210	71·91
Hydrogen	20	20	6·85
Nitrogen	1	14	4·80
Oxygen	6	48	16·44
Morphia	1	292	100·00

	Atoms.	*Eq. Wt.*	*Per Cent.*
Morphia	1	292	94·2
Water	2	18	5·8
Cryst. Morph.	1	310	100·00

The *morphitic salts* are, for the most part, crystallizable. When pure, they are colourless. They have a bitter taste.

The following characters of morphia are given in the *London Pharmacopœia*:

Very little soluble in cold water, little in boiling water, but very readily in alcohol. This solution exhibits alkaline properties when tried with turmeric; and, when the spirit is distilled from it, it yields crystals, which are totally destroyed by heat. On the addition of nitric acid, morphia becomes first red, and afterwards yellow. Tincture of sesquichloride of iron gives it a blue colour. Chlorine and [afterwards] ammonia being added to its salts, they are rendered of a brown colour, which is destroyed when more chlorine is added. Morphia is also precipitated from its salts by solution of potash, which, added in excess, redissolves it.

The precise relation which the effects of this alkaloid and its salts bear to those of opium, is a point on which the profession is by no means agreed. Some recent writers (Trousseau and Pidoux, *Traité de Thérap.* i. 164, 1836) declare that, after having carefully compared the effects of the morphia salts with those of opium, they can discover no difference between them; but my own limited observation of the effects of these salts induces me to agree with those who admit the similarity, but not the identity, of the effects of these substances. Charvet (*De l'Action Comp. de l'Opium*, 1826) could observe no difference between them in their action on the *invertebrata*. But on the higher classes of the *vertebrata* there were obvious differences. The effects of morphia on *man* are in several respects different from those of opium, but they appear to want uniformity; that is, the same results have not yet been arrived at by different experimenters. This may in some cases at least be ascribed to the employ-

ment of morphia contaminated with some other principles of opium. *In small doses*, as from a quarter of a grain to one grain, acetate of morphia causes a feeling of distension or fulness about the head, some disturbance of vision, oftentimes headache, giddiness and somnolency, or actual sleep, which, however, differs from ordinary sleep, and is often more or less disturbed. The pupils are usually contracted. Orfila says this occurs in nineteen out of twenty cases. However, in some instances dilatation has been observed, and in others the pupil was natural. The pulse is generally slow and small, though sometimes it is more frequent, and occasionally is soft and full. Itching of the skin is frequently noticed, or even a cutaneous eruption is by no means uncommon. Grain doses readily excite gastric uneasiness, nausea, and vomiting. One remarkable symptom often caused by acetate of morphia, especially in men, is a difficulty in voiding the urine, and which appears to depend on a weakened or paralytic condition of the bladder. Bally (*Mém. de l'Acad. Roy. de Méd.* i. 99) lays great stress on this last-mentioned symptom, especially when a full dose of morphia has been taken. When these effects subside, loss of appetite, muscular feebleness, and constipation, are left behind. When the dose is increased, the effects become somewhat alarming. Great cerebral excitement is produced, vision is disordered and obscured, there is singing in the ears, and the patient, when lying horizontally, experiences sudden convulsive movements, like those produced by the electric shock. When a fatal dose has been swallowed, the stomach sometimes manifests irritation, but this is soon followed by great disorder of the cerebro-spinal system, which ultimately assumes an apoplectic character. The sight becomes dim, excessive weakness is experienced, gradually all consciousness is lost, and coma supervenes, attended usually with contracted, though sometimes with dilated pupils, coldness of the surface, frequent and small pulse, hurried stertorous respiration, and occasionally with convulsions. Before insensibility comes on, as well as when it is subsiding, there is itching of the skin. Difficulty in passing the water is also experienced, in consequence of the paralysed state of the bladder. Not unfrequently, lividity of skin is observed.

The effects of morphia and its salts appear to be identical in their nature. The soluble salts (as the hydrochlorates) are more constant and certain in their operation than uncombined morphia, in consequence probably of the difficult solubility of the latter.

In comparing the morphitic salts with opium, we observe that they are less stimulant, and less disposed to cause sweating, constipation, headache, and dryness of the tongue. The feelings which they excite are less agreeable, and hence they are not adapted to be substituted for opium by the eaters of this drug. They more readily affect the bladder than opium.

Uses.—We employ morphia or its salts in preference to opium when our object is to make applications to the denuded dermis (*endermic medication*, see vol. i. p. 156). They are employed in this way for the purpose of alleviating violent neuralgic pains, and to relieve the excessive endermic operation of strychnia, (see p. 359 and 363). Gastrodynia and obstinate vomiting are sometimes relieved by the endermic application of morphia to the epigastrium; and violent headache by the application of this remedy to the temples. Occasionally this mode of administration is adopted, when we wish to bring the general system under the calming and sedative influence of morphia, and where from some cause its exhibition by the mouth is objectionable. Some cases of maniacal delirium may be treated with advantage this way.

The morphia salts are given internally in cases where we wish to obtain the anodyne, soothing, sedative, soporific, and antispasmodic qualities of opium, and where this drug is objectionable on account of its tendency to excite certain injurious effects already referred to (see p. 715). In all cases where both opium and the morphia salts are equally admissible, I prefer the former, its effects

being better known and regulated: moreover, opium is to be preferred as a stimulant and sudorific, and for suppressing excessive mucous discharges.

ADMINISTRATION.—The salts of morphia are given internally, in substance or solution, in doses of from one-eighth to one-fourth of a grain, or, beyond this. I have given in insanity two grains of muriate of morphia at a dose. For endermic use they are to be finely powdered, and applied to the extent of a grain or a grain and a half at a time.

MORPHIÆ ACETAS, L. E. (U. S.) *Acetate of Morphia.*—This salt is thus directed to be prepared by the *London College:*—

Take of Morphia, ʒvj.; Acetic Acid, fʒiij.; Distilled Water, fʒiv. Mix the acid with the water, and pour them upon the morphia to saturation. Let the liquor evaporate with a gentle heat, that crystals may be formed.

In this process the acetic acid saturates the morphia, and the solution by evaporation yields crystallized acetate of morphia.

The following are the directions of the *Edinburgh College:*—

"Take muriate of morphia, any convenient quantity. Dissolve it in fourteen times its weight of warm water, and, when the solution is cool, add aqua ammoniæ gradually, and with constant agitation, until there is a permanent but faint odour of ammonia in the fluid. Collect the precipitate on a calico filter, wash it moderately with cold water, and dissolve it by means of a slight excess of pyroligneous acid, in twelve parts of warm water for every part of muriate of morphia that was used. Concentrate the solution over the vapour-bath, and set aside to crystallize. Drain and squeeze the crystals, and dry them with a gentle heat. More acetate of morphia may be obtained on concentrating the mother liquor."

In this process the ammonia decomposes the muriate of morphia, and the precipitated morphia is afterwards dissolved in diluted pyroligneous (acetic) acid.

[Morphia (freed from Narcotina), ʒi.; Distilled Water, Oss.; Acetic Acid, a sufficient quantity. U. S. Proceed as directed by L. P.]

Acetate of morphia is usually prepared by evaporating its solution to dryness by a gentle heat. Obtained in this way it is amorphous. It is difficult to obtain pure, as it readily undergoes decomposition, when its solution is evaporated, and is converted into a mixture of morphia, neutral acetate, and the super-acetate of morphia. Hence, as met with in commerce, it is imperfectly soluble in water, unless a few drops of acetic acid be added. It is usually slightly coloured. Its crystals, when pure, are colourless and radiating. The following is the composition of this salt:—

	Atoms.	*Eq. Wt.*	*Per Cent.*
Morphia	1	292	82·95
Acetic acid	1	51	14·5
Water	1	9	2·55
Acetate of Morphia	1	352	100·00

Crystallized acetate of morphia is,—

Very readily dissolved in water. Its other properties are such as have been stated of morphia, *Ph. L.*

It is less soluble in alcohol than in water.

The *Edinburgh College* gives the following characters of the purity of this salt:—

One hundred measures of a solution of ten grains in half a fluid ounce of water and five minims of acetic acid, heated to 212°, and decomposed by a faint excess of ammonia, yields by agitation a precipitate which, in twenty-four hours, occupies 15·5 measures of the liquid.

The dose of this and the other morphitic salts has been already mentioned (see above).

3. MORPHIÆ HYDROCHLORAS, L. (U. S.) *Morphiæ Murias*, E.; *Hydrochlorate, or Muriate of Morphia.* In the *London Pharmacopœia* this salt is directed to be prepared as follows:—

Take of Opium, sliced, lb. j.; Crystals of Chloride of Lead, ʒij., or as much as may be sufficient; Purified Animal Charcoal, ℥iijss.; Hydrochloric Acid; Distilled Water; Solution of Ammonia, each as much as may be sufficient. Macerate the opium in four pints of distilled water for thirty hours, and bruise it; afterwards digest for twenty hours more, and press it. Macerate what remains again, and a third time, in water, that it may become free from taste, and

as often bruise and press it. Evaporate the mixed liquors, with a heat of 140°, to the consistence of a syrup. Then add three pints of distilled water, and, when all the impurities have subsided, pour off the supernatant liquor. Gradually add to this two ounces of chloride of lead, or as much as may be sufficient, first dissolved in four pints of boiling distilled water, till nothing further is precipitated. Pour off the liquor, and wash what remains frequently with distilled water. Then evaporate the mixed liquors as before, with a gentle heat, that crystals may be formed. Press these in a cloth, then dissolve them in a pint of distilled water, and digest, with an ounce and a half of animal charcoal, in a heat of 120°, and strain. Finally, the charcoal being washed, evaporate the liquors cautiously, that pure crystals may be produced. To the liquor poured off from the crystals first separated, previously mixed with a pint of water, gradually drop in as much solution of ammonia, frequently shaking it, as may be sufficient to precipitate all the morphia. To this, washed with distilled water, add hydrochloric acid, that it may be saturated: afterwards digest it with two ounces of animal charcoal, and strain. Lastly, the animal charcoal being thoroughly washed, evaporate the liquors cautiously, that pure crystals may be produced.

Water extracts from opium the *meconate and sulphate of morphia and codeia;* a part of the *narcotin*, of the *meconine*, of the *narceine*, and of the *thebaina;* the brown acid *extractive;* and a part of the *resin*, and of the *fat oil*. When chloride of lead is added to infusion of opium, meconate, with a little sulphate of lead, and some resinous colouring matter, are precipitated, while the hydrochlorates of morphia and of codeia are left in solution. A solution of the impure crystals is then decomposed by ammonia, by which the morphia is precipitated, while codeia and hydrochlorate of ammonia are left in solution. The morphia is dissolved in hydrochloric acid, and the solution of the hydrochlorate decolorized by charcoal.

The *Edinburgh College* follows Gregory's process. Their directions for preparing this salt are as follows:—

"Take of Opium, ℥xx.; Water, Oviij.; Muriate of lime, ℥j. or a slight excess.—Macerate the opium in fragments for twenty-four hours in two pints of water, and separate the infusion, squeezing well the residue. Repeat the maceration successively with two pints more of the water till the whole is made use of. Concentrate the whole infusion over the vapour-bath to one pint, and add the muriate of lime dissolved in four fluidounces of water. Set the whole aside to settle; pour off the liquid; wash the sediment with a little water, adding the washings to the liquid. Evaporate the liquid sufficiently in the vapour-bath for it to solidify on cooling. Subject the cooled mass to a very strong pressure in a cloth; redissolve the cake in a sufficiency of warm distilled water; add a little powder of white marble, and filter; acidulate the filtered fluid with a very little muriatic acid; and concentrate a second time in the vapour-bath for crystallization. Subject the crystals again to very strong pressure in a cloth. Repeat the process of solution, clarification by marble and muriatic acid, concentration and crystallization, until a snow-white mass be obtained.

"On the small scale, trouble and loss are saved by decolorizing the solution of muriate of morphia by means of a little purified animal charcoal after two crystallizations. But on the large scale it is better to purify the salt by repeated crystallizations alone, and to treat all the expressed fluids, except the first, in the same way with the original solution of impure muriate of morphia. An additional quantity of salt may often be got from the first dark and resinous fluid obtained by expression, on merely allowing it to remain at rest for a few months, when a little muriate of morphia may be deposited in an impure condition.

"The opium which yields the largest quantity of precipitate by carbonate of soda, according to the formula in p. 691, yields muriate of morphia, not only in greatest proportion, but likewise with the fewest crystallizations."

In this process the changes are analogous to those before described for the process of the London Pharmacopœia, except that meconate and sulphate of lime, instead of meconate and sulphate of lead, are produced.

Another, and, as it is believed, a greatly improved, method of obtaining morphia, has been recently suggested by Mohr.[1] It consists in adding, to a concentrated infusion of opium, milk of lime prepared with a quantity of dry lime, equal to the fourth part of the weight of the opium. The mixture is heated till it boils, and is filtered while hot through linen. The filtered liquor has a light brown yellow colour. While still hot it is mixed with pulverized sal ammoniac in excess; the lime is saturated by the muriatic acid of the sal ammoniac, and

[1] *Athenæum* for 1840, p. 772; *Report of the Tenth Meeting of the British Association*, Lond. 1841; and *Berlinisches Jahrbuch*, Bd. xliii. S. 448.

the ammonia of the latter is set free, and the morphia precipitated. In this way crystallized morphia may be obtained without the use of alcohol.

Pure hydrochlorate of morphia crystallizes in plumose, acicular crystals. It is colourless, odourless, bitter, soluble in from 16 to 20 parts of cold water, but less of boiling water. When its saturated boiling solution is allowed to cool, it congeals to form a crystalline mass. It is soluble in alcohol. By heat it is decomposed and totally dissipated. Nitric acid reddens it. Sesquichloride of iron with an alkali colours it blue.

The air-dried crystals are thus composed:—

	Atoms.	*Eq. Wt.*	*Per Cent.*
Morphia	1	292	76·24
Hydrochloric acid	1	37	9·66
Water	6	54	14·10
Crystallized Hydrochlorate of Morphia	1	383	100.00

According to the *London College*, crystallized hydrochlorate of morphia should be,—

Soluble in water. What is precipitated [i. e. *chloride of silver*] from the solution by nitrate of silver, is not totally dissolved either by ammonia, unless added in excess, or by hydrochloric or nitric acid.

[The U. S. P. directs this salt to be prepared by saturating the pure base with Muriatic Acid, and crystallizing.—J. C.]

The *Edinburgh College* gives the following characters of its purity:

"Snow white; entirely soluble; solution colourless; loss of weight at 212° not above 13 per cent.; one hundred measures of a solution of 10 grains in half a fluidounce of water heated to near 210°, and decomposed with agitation by a faint excess of ammonia, yield a precipitate which, in twenty-four hours, occupies 12·5 measures of the liquid."

On the above I would merely observe, that Mr. Sandall (*Lond. Med. Gaz.* xxii. 186,) found that the quantity of water which this salt loses by drying varies from 9·20 to 14·33 per cent.

The effects, uses, and doses of this, as well as the other morphitic salts, have been already described (see p. 717-18).

4. MORPHIÆ MURIATIS SOLUTIO, E.; *Solution of Muriate of Morphia.*—(Muriate of Morphia, 3iss.; Rectified Spirit, f℥v.; Distilled Water, f℥xv.; Mix the Spirit and Water, and dissolve the muriate of morphia in the mixture with the aid of a gentle heat.)—About one hundred and six minims of this solution contain one grain of muriate of morphia.—The dose is from ♏x. gradually increased to f℥ss.

5. TROCHISCI MORPHIÆ, E.; *Morphia Lozenges.*—(Muriate of Morphia, ℈j.; Tincture of Tolu, ℥ss.; Pure Sugar, ℥xxv. Dissolve the muriate of morphia in a little hot water; mix it and the tincture of Tolu with the sugar; and, with a sufficiency of mucilage, form a proper mass for making lozenges; each of which should weigh about fifteen grains.)—Each lozenge contains about one-fortieth of a grain of muriate of morphia. The morphia lozenges of the shops usually contain each one twenty-fourth of a grain of muriate of morphia. This is an agreeable mode of employing morphia, especially in pectoral affections.

6. TROCHISCI MORPHIÆ ET IPECACUANHÆ, E.; *Morphia and Ipecacuanha Lozenges.*—(Muriate of Morphia, ℈j.; Ipecacuan, in fine powder, ℥j.; Tincture of Tolu, f℥ss.; Pure Sugar, ℥xxv. Dissolve the Muriate in a little hot water; mix it with the tincture and the ipecacuanha and sugar; and, with a sufficiency of mucilage, beat the whole into a proper mass, which is to be divided into fifteen-grain lozenges.)—Each lozenge contains about one-fortieth of a grain of muriate of morphia, and one-thirteenth of a grain of ipecacuanha. Useful to allay tickling cough.

7. MORPHIÆ SULPHAS; (U. S.) *Sulphate of Morphia.*—This salt, though not contained in the British pharmacopœias, is occasionally used in medicine. It is crystalline, and readily

soluble in water. It consists of 1 atom *sulphuric acid* = 40, 1 atom *morphia* = 292, and 6 atoms *water* = 54. One of these atoms of water is an essential constituent of the salt, and cannot be removed without destroying the salt. The other 5 atoms are the water of crystallization. (It is prepared by saturating Morphia with Sulphuric acid, U. S.) The dose of it is the same as the other morphitic salts (see p. 719).

[THE LIQUOR MORPHIÆ SULPHATIS, U. S. *Solution of Sulphate of Morphia*, is made in the proportion of one grain to the ounce of water. Dose f 3i. to f 3ij.]

(SANGUINARIA CANADENSIS, *Linn.*—BLOOD ROOT.)

Sex. Syst. Polyandria, Monogynia.

(Sanguinaria, U. S. The Root.)

Gen. Char.—*Calyx* pentaphyllous, deciduous. *Petals* eight. *Stigma* sessile, two-grooved. *Capsule* superior, oblong, one-celled, two-valved, apex attenuated. *Receptacles* two, filiform, marginal (*Nuttall*).

Sp. Char.—*Root* tuberous, horizontal, giving out a reddish and very acrid lactescent sap. *Leaves* solitary, radical, reniform and lobed. *Scape* naked, one-flowered, sheathed at base. *Petals* variable in number. April. Perennial.

This plant is called *Blood Root*, from the red colour of its root, which, when wounded, pours out a quantity of red viscid juice. The same issues from the stalks of the leaves and flowers, but to a less amount. It is also known by the name of *Puccoon*. It grows throughout the United States, appearing in open woods at an early period of the spring, which it highly ornaments by its handsome white flowers.

The root is horizontal, from an inch to two inches in length, and half an inch in diameter, thicker at the summit, terminating abruptly as if bitten off, (*præmorse*,) fleshy, succulent, and beset with slender red fibres or radicles. It is taken from the ground during the summer, and when dried becomes dark brown externally, contracted, wrinkled, somewhat twisted. It breaks with a short, waxy fracture, presenting an orange-red colour upon the fractured surfaces. Its odour is feebly narcotic, disagreeable, but lost in a measure by drying. Its taste is acrid and bitter.

The powder is grayish-red.

Composition.—No detailed account of the constituents of this root have been presented, but Dr. Dana of New York has obtained from it an alkaline substance, which is probably the active principle of the root.

Sanguinarina (*Dana*).—This principle is obtained by digesting the finely-powdered root in absolute alcohol, and adding to the solution ammonia, so long as a precipitate is thrown down. This is boiled in water with animal charcoal, and filtered; what remains on the filter is digested in alcohol, and dried by evaporation. A *white pearly substance* remains. It has an acrid taste, renders the yellow of turmeric brown, and changes the infusion of purple cabbage-green. It is sparingly soluble in water, but soluble in ether and alcohol. With tincture of galls it affords a precipitate soluble in alcohol, but insoluble in ammonia. It combines with acids and forms salts, which all present some shade of red, crimson, or scarlet, of great intensity of beauty. (Smith, in *Journ. of Philada. Col. of Pharm.* vol. iii. p. 95.)

Medical Properties.—No experiments upon animals have been made with Blood Root to determine the effect it is capable of producing. It is stated that farriers sometimes give it to horses, in order to produce sweating, and facilitate the shedding of their hair. (*Downey's Essay*, p. 30.)

On man it produces effects which are characterized by considerable energy. In 1803 Sanguinaria was made the subject of an Inaugural Essay, by Dr. Downey, of Maryland, which appears to be the first attempt to determine its operation. Twenty grains of the recent root, and eight grains of the alcoholic and watery extracts, induced nausea and vomiting, with more or less sensation of warmth and heat in the stomach, acceleration of pulse, and in several experiments, a slight degree of headache. An acrimonious impression was uniformly made upon the fauces, and in several instances it acted on the bowels. The leaves are endowed with similar powers, and the seeds exert a marked power

over the brain and nervous system, occasioning torpor, languor, disordered vision, and dilatation of the pupils. These statements have been confirmed by subsequent investigation, and consequently Blood Root must be regarded as a stimulant, acrid emetic, and narcotic; a diaphoretic effect when produced must be accessary to these effects. In large doses the "emesis is violent, there is a burning sensation in the stomach, faintness, vertigo, dimness of vision, and alarming prostration." (*United States Dispensatory.*). The diseases in which it has been employed are those of the lungs, as pneumonia, catarrh, phthisis, croup, &c. It has also been used in rheumatism and in jaundice, but in the latter disease must be a remedy of questionable propriety. It was known to Dr. Shœff, who speaks of the employment of a decoction in gonorrhœa.

The mode of exhibition is in powder, the dose as an emetic being 20 grains. The form of pill is preferable, on account of the acrimony; as a stimulant and alterant, doses of 5 grains may be given every 3 or 4 hours. The infusion or decoction may be made in the proportion of ℥ss. to Oj. of water.—Dose, f℥ss. to f℥i.

[TINCTURA SANGUINARIÆ, U. S. *Tincture of Blood Root.*—Blood Root, bruised, four ounces; Diluted Alcohol, two pints. Macerate for fourteen days and filter through paper, or prepare by displacement. Dose, f℥ss. to f℥i. As an emetic, f℥ss.—J. C.]

Order LXXXII.—MENISPERMACEÆ, *De Candolle.*—THE COCCULUS TRIBE.

Menispermeæ, *Jussieu.*

Essential Character.—*Flowers* (by abortion?) unisexual, usually diœcious, very small. *Floral integuments* in one or several rows, each of which consists of three or four parts, hypogynous, deciduous. *Petals* sometimes absent. *Males: stamens* monadelphous, or rarely distinct; sometimes equal in number and opposite to, the petals; at other times three or four times as many; *anthers* adnate, turned outwards, or inserted on the apex of the filament. *Females: ovaries* sometimes numerous, each with one style cohering slightly at the base; sometimes solitary, crowned with many stigmas, internally many-celled, and, therefore, consisting of many carpels soldered together. *Drupes* usually berried, one-seeded, oblique or lunate, compressed. *Seed* of the same shape as the fruit; *embryo* curved or turned in the direction of the circumference; *albumen* none, or small and fleshy; *cotyledons* flat, sometimes lying face to face, sometimes distant from each other, and lying in two cells of the seed!; *radicle* superior, but sometimes appears inferior when the apex of the fruit is, by the mode of growth, contiguous with the base.—Sarmentaceous, flexible tough *shrubs*. *Leaves* alternate, simple or rarely compound, mucronate. *Flowers* small, usually racemose. (De Cand.)

Properties.—The roots of several species are bitter and tonic; the seeds of some of them are narcotic.

1. COC'CULUS PALMA'TUS, *De Candolle, L. E.*—THE CALUMBA PLANT.

Menispermum palmatum, *Lamarck.*

Sex. Syst. Diœcia, Hexandria.

(Radix, *L. D.*—Root, *E.*)

(Colomba, U. S.)

History.—Franciscus Redi, (*Exp. circa varias res nat.* p. 179,) in 1675, is the first writer who mentions the root of this plant: he praises it as an alexipharmic or antidote for poisons. Cartheuser afterwards examined it; but Dr. Thomas Percival (*Med. Essays*, vol. ii. p. 3, 1773) gave the best account of it. This root has been known by various names, such as *Calumba*, *Colombo*, *Calomba*, and *Colomba*. Its native country and history were long involved in obscurity. In 1830, Dr. Hooker (*Bot. Mag.* 2970-71) published a complete description of both the male and female plants. The root was at first supposed to come from Colombo, a town of Ceylon, and from which it was said to derive its name. But it is now known to be the produce of Mozambique. Its English name Calumba is derived from the Portuguese word *Kalumbo*, the *o* in which is mute. (Berry, *Asiatic Researches*, x. 385.)

Botany. **Gen. Char.**—*Flowers* unisexual, (always?) dicœcious. *Calyx* of twelve sepals in four series, with two, three, or more, close-pressed bracteoles. *Males: stamens* six, or rarely three, opposite to the inner sepals, distinct; *anthers* two-celled, terminal, dehiscing vertically; *filaments* either filiform with the anther cells horizontal, approximate, and each externally two-lobed, or thickened at the apex with the cells divaricating downwards, and separated by the connective. *Females: ovaries* three, six, or numerous. *Drupes* one to six, or numerous, one-celled, one-seeded. *Peduncles* axillary or rarely lateral; males usually many-flowered; females generally few-flowered, without bracts, or with very small ones if present (Lindley).

Fig. 249.

Cocculus palmatus.
(Male plant.)

Sp. Char.—*Leaves* cordate at the base, five to seven-lobed; lobes quite entire, acuminate, somewhat hairy. *Stems* and *ovaries* clothed with glandular hair (De Cand).

Root perennial, of several fasciculated, fusiform, fleshy tubers, with a brown warty epidermis; internally deep-yellow, odourless, very bitter. *Stems* annual, herbaceous, twining, beset at the lower part with long glanduliferous hairs: of the males, simple; of the females, branching. *Leaves* alternate, nearly orbicular, wavy on the margin, with long hairy footstalks. *Racemes* axillary, solitary; in the male plants compound. *Flowers* small, green. *Fruit* drupaceous or berried, about the size of a hazel-nut, densely clothed with long-spreading hairs, tipped with a black oblong gland. (Bojer, in Hooker's *Bot. Mag.* tt. 2970-71.)

Hab.—Thick forests on the shores of Oibo and Mozambique, as well as inland for 15 or 20 miles.

Preparation of the Roots.—The natives never cultivate the plant, the spontaneous produce being sufficient. The roots are dug up in March (the hot season), the offsets from the main root are cut in slices, strung on cards, and hung up to dry in the shade. It is deemed fit for commerce, when, on exposure to the sun, it breaks short; and of a bad quality when it is soft or black.

Description.—Calumba or Colombo root (*radix calumbæ*) is met with in flat circular or oval pieces, of from half an inch to three inches diameter, and from one to three or four lines thick. It occurs also in cylindrical pieces of from one to two inches long. The epidermis covering the sides of the piece is of a yellowish-gray or brownish colour, smooth or irregularly rugous. The transversal surfaces are of a greenish or grayish-yellow colour, depressed in the middle from the great shrinking of the medulla in the drying process, and consist of three or four concentric layers. The outer or cortical portion varies in thickness, but is usually about two or three lines thick. It is separated from the ligneous portion by a dark-coloured layer, not exceeding a hair in thickness. The internal or medullary portion is light, spongy, and shrunk. The odour of calumba is faint, but somewhat aromatic: the taste aromatic, and very bitter. In the larger and thicker pieces small holes are occasionally observed, which have been made for the convenience of drying. On account of the starch which it contains, the root is readily attacked by insects.

I am indebted to Mr. N. B. Ward for a sample of calumba root cultivated at the Mauritius. It is deficient in the bright greenish yellow tint of the Mozambique calumba.

Commerce.—In the year 1838, duty (2d. per lb.) was paid on 19,805 lbs., and in 1839 only on 9384 lbs. of calumba.

Composition.—The more recent analyses of Calumba root are those of Planche (*Bull. de Pharm.* iii. 189) and Buchner. (*Pharm. Central-Blatt für* 1831, S. 429.)

	Planche.	*Buchner.*
Bitter matter	13	10 to 12·2
Animal matter, soluble in water and not in alcohol	6	0
Yellow resinous extractive	0	5·0
Volatile oil	a trace	0·0
Wax	0	0·2
Gum	9	3·8 to 4·7
Starch	33	30 to 35
Vegetable medulla [pectin ?]	0	17·4
Woody fibre	39	12·6
Water	0	9·8
Loss		?
Calumba root	100	100

1. Odorous Principle (*Volatile Oil?*)—The odour of the root is supposed to depend on a volatile oil, traces of which were procured by Planche. The distilled water of the root possesses the odour of the latter.

2. Calumbin.—(*Bitter Principle*).—A crystallizable, odourless, very bitter, neutral substance, extracted from Calumba root by Wittstock. (*Ibid.* 1830, S. 517.) Its crystals are rhombic prisms. It is fusible; very slightly soluble in water, alcohol, ether, and volatile oils. Boiling rectified spirit dissolves about 1-40th of its weight. It dissolves in acids and alkalis; its best solvent being acetic acid. It is unaffected by metallic solutions, and by infusion of nutgalls. Sulphuric acid dissolves it, assuming first a yellow, then a red colour. Its composition, according to Liebig, is *carbon* 65·45, *hydrogen* 6·18, *oxygen* 28·37: or C^{12} H^{7} O^{4}.

Planche describes the active principle of calumba as a *yellow bitter matter* soluble in water and alcohol, and yielding no precipitate either with the salts of lead or infusion of galls.

3. Starch.—This constitutes about one-third by weight of the root. It renders the root an easy prey to insects. The structure of the starch particles has been described by Payen. (*Ann. Scient. Nat.* Botany, July, 1838, p. 20.) These bodies are remarkable by their gibbosities, and by the hilum being found on the largest part of the particles.

Chemical Characteristics.—If the root be moistened with water, and then touched with tincture of iodine, it becomes black. A decoction of the root when cold forms with a solution of iodine a blue colour (*iodide of starch*). Sulphate of iron, emetic tartar, and gelatine, produce no obvious change in an infusion of calumba, showing the absence of tannic and gallic acids. Litmus detects no free acid. Infusion of nutgalls causes in the infusion of calumba a precipitate (*tannate of starch?*)

Adulteration.—The root of *Frasera Walteri*, called the *American* or *false calumba*, (see p. 344,) has been occasionally substituted for calumba root on the continent. Such a fraud would not be practicable in England, at least to any extent, as the appearance of the root is quite dissimilar to that of the genuine calumba. It is distinguished chemically from the latter by three characters: 1st, It undergoes no change of colour when touched with tincture of iodine, showing that it contains no starch; 2dly, It becomes blackish green on the addition of sulphate of iron; 3dly, It yields a precipitate with a solution of gelatine. The two last characters indicate the presence of tannic acid.

Physiological Effects.—Calumba is an excellent tonic; promoting the appetite, assisting the digestive process, and improving the quality of the secretions from the gastro-intestinal mucous membrane. It is not a stimulant; for Dr. T. Percival took a scruple of it on an empty stomach, but did not observe that it had the least effect on the regularity, fulness, or velocity of the pulse. In another experiment he swallowed half a drachm: in ten minutes his pulse was fuller, and slower by three beats, and continued so for three quarters of an hour. In consequence of the quantity of starch and gum which it contains, it is sometimes termed a *mucilaginous* or *demulcent tonic*. *Cetraria islandica* and Simaruba bark agree with calumba in this circumstance. But from them, as well as from Quassia, it is distinguished by its aromatic properties. In some respects (*i. e.* in its tonic and aromatic qualities) it approximates to rhubarb, but is devoid of the purgative and astringent properties of the latter. Its want of astringency distinguishes it from the astringent tonics (as cinchona). Full doses of it, in the form of powder, given when the stomach is very irritable,

cause vomiting. It does not appear either to constipate or relax the bowels We are not acquainted with the effects of excessive doses of it. Poisonous properties have been assigned to it by Buchner, (*Toxikol.* S. 229,) who states, that Hartl, one of his pupils, applied a grain of the etherial extract of calumba, deprived of wax by repeated solution in water, to a wound in the leg of a rabbit, and that it proved fatal in ten hours.

Uses.—Calumba is one of our most useful stomachics and tonics. Its great value consists in its not being apt, like other and more powerful tonics, to create nausea, sickness, febrile disorder, or headache, so that it is tolerated when other remedies of this class would be immediately rejected. Indeed on many occasions it evinces a positive power of checking vomiting. Schwilgué, (*Mat. Méd.* ii. 374,) in order to test its anti-emetic qualities, gave it when vomiting had commenced after the use of emetic tartar and ipecacuanha. It frequently arrested the vomiting. He also gave it in conjunction with these emetics, and observed that the vomiting occurred more slowly than usual, and was milder. Probably it owes these valuable properties to a combination of circumstances; such as its freedom from acidity and astringency, the large quantity of starch which it contains (from which it acquires demulcent properties), and the peculiar operation of its bitter principle. The following are the principal uses to which it has been applied:

1. *In a languid state of the stomach, with general debility*, attended with want of appetite, indigestion, nausea, and flatulence, experience has fully established the value of calumba, and has proved the justice of the encomiums passed on it by Dr. T. Percival. It is of all tonics the least likely to disagree with the stomach. In the stage of convalescence after an attack of fever, the infusion of calumba is an excellent preparative for the more powerful tonics (infusion of cinchona and disulphate of quina). In those forms of dyspepsia attended with great acidity of stomach, it may be given with advantage in combination with bicarbonate of potash.

2. *To allay vomiting*, when not dependent on inflammatory conditions of the stomach, calumba is often highly serviceable; as in bilious vomiting, in the sickness which so frequently attends pregnancy and dentition. Even vomiting arising from renal calculi or diseased kidney has been somewhat palliated by calumba. I have seen the most satisfactory results from the combined use of infusion of calumba and effervescing draughts (composed of citric acid and bicarbonate of potash) in those occasional attacks of vomiting especially observed in delicate females, and which are commonly termed bilious attacks. By this treatment the violence and continuance of the vomitings have been diminished, and the continued employment of calumba has reduced the frequency, and in some cases prevented the occurrence, of future attacks.

3. *In diarrhœa and dysentery*, where tonics are admissible, as in the later periods of these diseases, when the inflammatory symptoms have subsided, and in habitual diarrhœa, calumba often proves serviceable. In Germany it is denominated *Ruhrwurzel*, (i. e. *dysenteric root*).

Administration.—Calumba is administered in the form of *powder*, *infusion*, or *tincture*. The dose of the *powder* is from gr. x. to 3ss. The infusion is the most eligible form of exhibition.

1. INFUSUM CALUMBÆ, L. E. *Infusion Colombœ*, D. (U. S.); *Infusion of Columba*. (Calumba, sliced [in coarse powder, *E.*], 3v. [3ss. *E.*; 3ij. *D.*]; Boiling [distilled, *L.*] Water [Cold Water, *E.*], Oj. [Oss. *wine-measure*, *D.*] Macerate for two hours in a lightly covered vessel, and strain, *L. D.*—"Triturate the Calumba with a little of the water, so as to moisten it thoroughly: put it into a percolator, and transmit cold water till f 3xvj. of infusion be obtained," *E.*)—(Colombo, bruised, half an ounce; Boiling Water a pint. Macerate for two hours in a covered vessel and strain, U. S.)—The facility with which this preparation undergoes decomposition is ascribed by Planche to the substance

which he terms *animal matter*.—Dose of the infusion, f℥j. to f℥ij. It may be conjoined with alkalis or chalybeates, without injury or obvious change.

2. TINCTURA CALUMBÆ, L. E. *Tinctura Colombæ*, D. (U. S.) *Tincture of Calumba.* (Calumba, sliced [in small fragments; if by percolation in moderately fine powder, *E.*], ℥iij. [℥ijss. *D.*]; Proof Spirit, Oij. [*wine-measure*, D.] Macerate for fourteen days, and filter. "Digest for seven days, pour off the clear liquor. Express the residuum strongly, and filter the liquors. This tincture is much more conveniently prepared by the process of percolation, allowing the powder to be soaked with a little of the spirit for six hours before putting it into the percolator," *E.*)—(Colombo, bruised, four ounces; Diluted Alcohol two pints. Macerate for fourteen days and filter through paper, or by displacement, *U. S.*)—An excellent adjunct to bitter infusions and effervescent medicines, when given to check vomiting. Dose, f℥j. to f℥ij.

2. ANAMIR'TA COC'CULUS, *Wight and Arnott*, *E.*—THE COCCULUS INDICUS PLANT.

Coc'culus subero'sus De Candolle, *D.*

Sex. Syst. Diœcia, Monadelphia.

(Fruit, *E.*—Fructus vulgo Cocculus indicus, *D.*)

HISTORY.—"According to Sprengel, (*Berl. Jahrb.* xxiii. 1822, S. 70,) the fruit now usually called *Cocculus indicus* was introduced by the Arabians, and was described by Avicenna and Serapion under the name of *Maheradsch*." (Schwartze, *Pharm. Tabell.* S. 388, 2te Ausg.) In my copy, however, of the Latin translation of Avicenna, (Venet, 1564,) the word *Maheradsch* does not occur: but *Mahezeheregi* or *Maheizhera* (Lib. 2ndus, tr. 2ndus, cap. 488,) is said to intoxicate fish. Nor can I find it in Serapion. Cocculus indicus is sometimes termed the *Levant nut* or *bacca orientalis*.

BOTANY. **Gen. Char.**—*Flowers* diœcious. *Calyx* of six sepals in a double series, with two close-pressed bracteoles. *Corolla* none. *Male: Stamens* united into a central column dilated at the apex; *anthers* numerous, covering the whole globose apex of the column. *Female: flowers* unknown. *Drupes* one to three, one-celled, one-seeded. *Seed* globose, deeply excavated at the hilum; *albumen* fleshy; *cotyledons* very thin, diverging.—Twining *plants*, with a corky bark. *Leaves* more or less cordate-ovate. *Flowers* in lateral compound racemes (*Wight and Arnott.*)

Sp. Char.—The only species.

A strong climbing *shrub*. *Bark* deeply cracked, ash-coloured. *Leaves* stalked, large (from eight to twelve inches long); petiole a little shorter than the leaves.

Hab.—Malabar, and Eastern Islands, &c. of India.

DESCRIPTION.—As met with in commerce, *Cocculus indicus* (also called *Cocculus levanticus* seu *piscatorius*) has considerable resemblance to the bay berry (*bacca lauri*, see p. 253), but is scarcely so large as the latter. It consists externally of a dried, thin, blackish-brown, rugous, acrid, and bitter layer, which envelopes a thin, bivalved, white, ligneous shell (*endocarp*). In the middle of this shell arises a central placenta, which is contracted at its base, but enlarged and divided into two cells superiorly. Between this placenta and the shell is an oleaginous, yellowish, very bitter nucleus (*seed*) of a semilunar form. This nucleus never wholly fills the cavity of the shell,—at least in the Cocculus indicus of commerce; for by keeping, it gradually becomes atrophied, and in old samples it is not uncommon to find the shell almost empty. This change is observed also in other oleaginous seeds. By this character alone, Cocculus indicus may be instantly distinguished from the bay berry. The *Edinburgh College* requires that,—

"The kernels should fill at least two-thirds of the fruit."

Commerce.—Cocculus indicus is imported in bags from Bombay, Madras, and Ceylon. I am not acquainted with any official returns of the quantity annually brought over. From a druggist's private books I find that, in 1834, about 2500 bags entered; and this probably is much below the quantity imported. The greater part is consumed for illegal purposes,—principally for adulterating beer and ale; though this practice is prohibited by the legislature, under a penalty of 200*l.* upon the brewer, and 500*l.* upon the seller of the drug.

Composition.—Cocculus indicus was examined in 1811, by Boullay, (*Ann. de Chim.* lxxx. 209) and in 1834 by Pelletier and Couerbe. (*Ann. Chim. et de Phys.* liv. 181.) The results obtained by the last-mentioned chemist, were as follows:—

Analysis of the Nucleus.	*Analysis of the Shell.*
1. Picrotoxin.	1. Menispermin.
2. Resin.	2. Paramenispermin.
3. Gum.	3. Yellow alkaline matter.
4. A fatty acid substance.	4. Hypopicrotoxic acid.
5. An odorous matter.	5. Wax.
6. Malic acid.	6. Starch.
7. Mucus.	7. Chlorophylle.
8. Starch.	8. Resinous matter.
9. Lignin.	9. Gum.
10. Waxy matter.	10. Fatty matter.
11. Inorganic substances (nitrate and sulphate of potassa, and chloride of potassium), by incineration carbonates of potash, and of lime, manganese and iron.	11. Inorganic substances (as those of the nucleus with the addition of copper).

1. Picrotoxin (*Picrotoxic Acid*).—At first it was supposed to be an alkaline substance, and was termed *picrotoxia*. It is a white, crystalline, intensely bitter substance, usually crystallizing in needles, but sometimes in silky flexible filaments or transparent plates, or granular crystals. It is soluble in 150 parts of water at 57° F., in 25 parts of boiling water, in a third of its weight of alcohol, and in less than half its weight of ether. It is insoluble in the fixed and volatile oils, but is insoluble in acetic acid. It does not combine with acids, but forms combinations with alkalis. It seems, therefore, to be an acid, though a feeble one. It consists of C^{12} H^{7} O^{5}. The poisonous properties of the nucleus (seed) of cocculus indicus depend on picrotoxin.

2. Menispermia (*Menispermina; Menispermine*).—This is an opaque, white, crystalline substance, soluble in alcohol and ether, but insoluble in water. It fuses at 248° F., and at a higher temperature is decomposed, leaving an abundant charcoal. It dissolves in, and saturates acids; and from these solutions alkalis precipitate it. Concentrated sulphuric acid has little action on it: hot nitric acid converts it into a yellow resinous substance, and oxalic acid. It is composed, according to Gay-Lussac, of C^{18} H^{12} N O^{9}. It does not appear to have any marked action on the animal economy.

3. Paramenispermia (*Paramenispermina; Paramenispermine*).—This is a crystalline solid, insoluble in water, scarcely soluble in ether, but dissolving readily in alcohol. It is fusible and volatile, and may be sublimed unchanged. It does not saturate acids, and, therefore, differs in this respect from the preceding substance. Notwithstanding this, however, its composition is the same.

4. Hypopicrotoxic Acid.—This acid is an amorphous, brown solid, insoluble in water (cold or boiling), insoluble in ether, soluble in alkalis, and precipitable from its solution in them by the mineral acids. It is composed of *carbon* 64·14, *hydrogen* 6·09, *oxygen* 29·77. This composition approximates to that of picrotoxin.

The *yellow alkaline matter* of the shell has been scarcely examined.

Boullay (*Journ. de Pharm.* xiv. 61) mentions a crystalline substance which he calls *menispermic acid;* but its properties require further examination. (See Casaseca, *Ann. Chim. et Phys.* xxx. 307.)

Chemical Characteristics.—Iodine colours the nucleus brown. The cold watery infusion of the whole fruit is slightly acid, and produces a dark precipitate with the sesquichloride of iron. Infusion of galls also occasions a precipitate.

Physiological Effects. *α. On Vegetables.*—A solution of the aqueous extract of Cocculus indicus killed a haricot plant in twenty-four hours. (Marcet, *Ann. Chim. et Phys.* xxix. 215.)

β. On Animals generally.—It is poisonous to all animals; at least it has been found to be poisonous to dogs, goats, cows, crocodiles, birds, and insects. Goupil (quoted by Orfila, *Toxicol. Gén.*) considered it to be a local irritant;

but the correctness of this opinion is denied by Orfila. (*Toxicol. Gén.*) When introduced into the stomach its irritant effects were confined to the production of nausea and vomiting. It acts on the cerebro-spinal system, causing staggering, trembling, tetanic convulsions, and insensibility. Goupil states that all fish which eat it die,—roach being killed very easily, barbel with more difficulty. "The barbel," we are told, "is, of all fish, that whose flesh the most frequently occasions accidents in those animals who eat it; probably because these fish, taking a longer time to die, the poison is longer subjected to the action of the digestive juices, and a considerable quantity of it is consequently absorbed." Orfila says, Cocculus indicus acts like camphor on the nervous system, and principally on the brain.

γ. *On Man.*—Its effects on man have not been accurately ascertained. Hill (*Hist. of the Mat. Med.*) says, three or four grains of it have brought on nausea and faintings. It is frequently added to malt liquors, for the purpose of increasing their intoxicating powers; but, from some accounts which I have received from an excise officer, who has been repeatedly subjected to the influence of beer thus adulterated, its action appeared to be rather on the voluntary muscles than on the intellectual powers.

The operation of *Picrotoxine* is analogous to, though stronger than, that of Cocculus indicus. Ten or twelve grains, given by the mouth, are sufficient to kill a dog. A grain and a half, injected into the jugular vein of a dog, killed the animal in twenty minutes.

Uses.—Cocculus indicus is rarely employed in medicine. It has, however, been used as an external application, in the form of powder or ointment, to destroy pediculi (hence the Germans call these fruits *Läusekorner*, or *lousegrains*). It has also been employed in some obstinate skin diseases, as porrigo; but its use requires caution, especially where the skin is not entire, on account of the danger of absorption. Notwithstanding the severe prohibitory statutes against the employment of Cocculus indicus in brewing, I have reason to believe that it is extensively used; but being employed in the form of a solution of the extract, the form is not easy of detection. Morrice (*Treatise on Brewing*,) gives full directions for its employment. In the manufacture of porter, this author directs three lbs. of Cocculus indicus to be added to every ten quarters of malt. "It gives," says he, "an inebriating quality, which passes for strength of liquor;" and he adds, "that it prevents second fermentation in bottled beer, and consequently the bursting of the bottles in warm climates."

Antidote.—In poisoning by Cocculus indicus, or picrotoxin, remove the poison from the stomach as speedily as possible. No chemical antidote is known, though acetic acid has appeared to give relief. The symptoms must be combatted on general principles, no peculiarities in the treatment being known. As a last resource, try artificial respiration.

UNGUENTUM COCCULI, E. *Ointment of Cocculus indicus.*—(Take any convenient quantity of Cocculus indicus, separate and preserve the kernels; beat them well in a mortar, first alone, and then with a little axunge, and then add axunge till it amounts, altogether, to five times the weight of the kernels.)—Used to descroy pediculi.

Jäger (*Rust's Mag.* Bd. xiv. St. i. S. 105,) has an *ointment of picrotoxin* (composed of gr. x. of picrotoxin and ℥j. of lard) in obstinate forms of porrigo.

3. CISSAM'PELOS PAREI'RA, *Linn.* E. D.—PAREIRA BRAVA OR VELVET LEAF.

Sex. Syst. Diœcia, Monadelphia.
(Radix, *L.*—Root, *E.*)
(Pareira, U. S. Sec. List.)

History.—The root of this plant was first mentioned by Piso (*Hist. Nat. Brasil*, 94,) in 1648, under the name of *Caapéba*. It was introduced into

Paris, in 1688, by M. Amelot, French ambassador at Portugal. (Murray, *App. Med.* i. 499.)

It is usually termed *Pareira* (Parreyra) *brava*, which means, literally, *wild vine*, on account of its supposed resemblance to the root of the wild vine. The Germans call it *Grieswurzel* (*i. e.* gravel root), on account of its beneficial effects in stone or gravel.

Botany.—**Gen. Char.**—*Diœcious. Male: sepals* four, in a double series. *Petals* four, united into a cup-shaped corolla, with usually an entire margin. *Stamens* united into slender columns dilated at the apex, bearing two two-celled anthers opening horizontally; cells placed end to end, and forming a four-lobed, four-celled annulus round the top of the column. *Female: calyx* of one! lateral sepal. *Corolla* of one! petal in front of the sepal. *Ovary* solitary. *Stigmas* three. *Drupe* obliquely reniform; but compressed, wrinkled round its margin. *Seed* solitary uncinate; *embryo* long, terete, enclosed in a fleshy albumen (Wight and Arnott).

Sp. Char.—*Leaves* peltate, subcordate, ovate-articulate; silky-pubescent beneath. Female *racemes* larger than the leaf. *Berry* hispid (De Cand.)

A climbing *shrub*. *Root* woody, branching. *Stem* round, smooth, or with close-pressed down. *Leaves* aristate at the point, when full-grown smooth above, underneath covered with silky pubescence (hence called *velvet leaf*), but not truly downy. *Flowers* small, yellow. *Berry* scarlet, round or reniform, hispid.

Hab.—West India Islands and Spanish Main.

Description.—The root of Cissampelos Pareira, commonly termed *pareira brava* (*radix pareiræ bravæ*), is sometimes imported under the name of *abuta* or *butua root* (*radix butuæ*). Von Martius says, that in the Brazils, Cissampelos Pareira is called *Butua* or *Capeeba*. Pareira brava occurs in more or less cylindrical pieces, sometimes flattened or bluntly angular. Some of the pieces are as thick as a child's arm,—their length often a foot or more long. Externally they are covered with a dark-brown rind or cortex, which is furrowed longitudinally, and wrinkled transversely. The wrinkles have very much the appearance of large, transversely elongated lenticellæ. The surface of the transverse section of the root is of a yellowish-gray colour, and presents a number of concentric circles (the annular layers), traversed by numerous radiating lines (medullary rays); between these lines are triangular bundles of woody fibres and ducts,—the latter are large, and being cut transversely, constitute the numerous holes or apertures presented by the cut surface. The circles or layers occasionally assume a very eccentric appearance.

The number of concentric circles varies with the age of the root. The fracture of the root is coarsely fibrous. The taste is sweetish—aromatic, afterwards bitter and unpleasant. The root has no odour.

Substitution.—The pareira brava of commerce yields most unequal quantities of extract. This circumstance, as well as some variation in the appearance of the pieces, leads to the belief that the roots (and stems?) of more than one plant, are sold under this name. A sample of supposed spurious root, (see *Lond. Med. Gaz.* vol. xviii. p. 992; and vol. xix. p. 835,) yields "only a very minute quantity of the extract; and the decoction prepared from it, according to the usual formula, has only a slightly bitter taste, instead of the strong bitter of the decoctions" of the true root. A piece of this supposed spurious root presents an appearance of medulla, and is covered externally with a lichen, whence it would appear to be a portion of a stem.

Composition.—Pareira brava has been analyzed by Feneulle, (*Journ. de Pharm.* vii. 404,) who found the constituents to be, *a soft resin, a yellow bitter principle, a brown colouring principle, vegeto-animal matter, fecula, supermalate of lime, nitrate of potash*, and some *ammoniacal and mineral salts*. More recently, Wiggers (*Berl. Jahrb.* xl. 223, 1838,) has announced the discovery of a new vegetable alkali, which he calls *cissampelin*, in this root.

1. Feneulle considers the YELLOW BITTER MATTER to be the active principle of the root. It is described as being soluble in both alcohol and water. From its solution it was precipitated by tincture of nutgalls as well as by subacetate of lead. In these properties it appears to agree with cathartine (see p. 587): but it is, probably, a mixture of several substances.

2. The properties of CISSAMPELIN have not been described. Wiggers says it is a strong saline base, soluble in ether and in acetic acid. From its acetic solution it is precipitated by carbonate of soda.

CHEMICAL CHARACTERISTICS.—The presence of starch in the root is shown by iodine. An infusion of the root yields a precipitate on the addition of infusion of galls, and is rendered brown by the sesquichloride of iron.

PHYSIOLOGICAL EFFECTS.—I am unacquainted with any experiments made to determine the effects of this root in the healthy state of the body. From its taste, botanical affinities, and effects in diseases, it appears to possess a tonic power, and occasionally to act as a diuretic. Furthermore, its efficacy in certain maladies of the urinary organs induces us to ascribe an almost specific influence to this root over the mucous membrane lining the urinary passages. It certainly does appear to have the power of altering the quality of the urinary secretion. Large doses prove aperient.

USES.—It was originally introduced into medicine as a lithontriptic. Its powers in this way were at one time highly vaunted, and Helvetius even went so far as to assert that calculi, the size of an olive, had disappeared under its use, and that the operation of lithotomy was no longer necessary! We now employ it almost solely *in discharges from the urino-genital mucous membrane*. It has been used in gonorrhœa, leucorrhœa, and chronic inflammation of the bladder. In the latter of these diseases Sir B. Brodie (*Lond. Med. Gaz.* i. 300,) states, that he has seen more good done by this root than by the Uva-ursi. "I am satisfied," says this eminent surgeon, "that it has a great influence over the disease which is now under consideration, lessening very materially the secretion of the ropy mucus, which is itself a very great evil, and, I believe, diminishing the inflammation and irritability of the bladder also." He recommends it to be taken in the form of a concentrated decoction, to which may be added some tincture of hyoscyamus; and in these cases, in which there is a deposit of the triple phosphates, muriatic or diluted nitric acid may be added.

ADMINISTRATION.—The *powder* has been given in doses of from half a drachm to a drachm. But the *infusion* or *decoction*, to which some *extract* has been added, is to be preferred. A *tincture* or *essence* has been prepared by digesting one part of the root in five parts of rectified spirit. It is reputed diuretic and anticatarrhal. Its dose is f℥j.

1. INFUSUM PAREIRÆ, L. E. *Infusion of Pareira brava.*—(Pareira, ℥vi.; Boiling Water, Oj. Macerate for two hours in a lightly covered vessel, and strain [through calico, *E.*]).—Dose, f℥j. to f℥iij. It will be advisable to increase the strength of this decoction by the addition of some extract of pareira to it. Furthermore, narcotics (as opium or hyoscyamus) or acids may be conjoined according to circumstances. Sir B. Brodie employs a *decoction of pareira* (prepared by boiling half an ounce of the root in three pints of water, down, by gentle simmering, to one pint); of this eight or twelve ounces should be taken daily.

2. EXTRACTUM PAREIRÆ, L. E. *Extract of Pareira brava.* (Prepared as Extract of Gentian [as Extract of Liquorice-root, *E.*])—Dose, gr. x. to ℥ss. It is usually given in conjunction with the infusion or decoction.

OTHER MEDICINAL MENISPERMACEÆ.

The student must not confound PAREIRA BRAVA with the PEREIRA BARK belonging to Strychnaceæ, and before noticed (see p. 364), nor with the PEREIRA MEDICA, Lindley, *Fl. Med.* 370,) a menispermaceous plant, whose root is employed by the Cingalese as a stomachic.

Order LXXXIII.—MAGNOLIACEÆ, *De Candolle*.—THE MAGNOLIA TRIBE.

Magnoliaceæ and Winteraceæ, *Lindley*.

Essential Character.—All the parts of the flower disposed in ternary number. *Sepals* three to six, deciduous. *Petals* three to twenty-seven, in many series, hypogynous. *Stamens* numerous, free, inserted on the torus beneath the ovaries; *anthers* adnate, elongated. *Ovaries* numerous, inserted on the torus above the stamens, generally disposed like a spike, monostylous: *styles* short; *stigmas* simple. *Carpels* as many as the ovaries, one-celled, one or many seeded; capsular, and dehiscing by a superior chink; or capsular and bivalved, dehiscing by an inferior chink; or follicular; or somewhat fleshy and indehiscent; or, lastly, samariform, aggregate, or partially united into a loose or dense strobile. *Seeds* attached to the internal angle of the carpels; *albumen* fleshy; *embryo* straight, small, inferior.—Elegant *trees* or *shrubs*. *Leaves* alternate, pinnatinerved. *Flowers* conspicuous, often powerfully odoriferous (De Cand.)

Properties.—Bark tonic and aromatic. The same properties are possessed by some of the fruits. The flowers by their odour readily occasion nausea, headache, and faintness.

DRIMYS WINTERI, *De Candolle*, D.—WINTER'S BARK TREE.

Wintera aromatica, *Murray*.

Sex. Syst. Polyandria, Tetragynia.

(Cortex, *D.*)

(Wintera, U. S.)

History.—William Winter, captain of one of the ships which accompanied Sir Francis Drake, in the year 1578, to the Straits of Magellan, returning in 1579, brought the bark of some trees, which he had cut down there, to Europe. From this circumstance Clusius (*Exot.* lib. iv. cap. 1, p. 75) called it *Winter's bark* (*Winteranus cortex*). It was afterwards confounded with Canella bark (see p. 644).

Botany. **Gen. Char.**—Carpels congested, baccate, many-seeded. *Filaments* thickest at the apex; cells of the anther separate. (De Cand.)

Sp. Char.—*Leaves* oblong, obtuse, glaucous beneath. *Peduncles* simple, approximated, or very short, divided into elongated pedicels. (De Cand.)

Fig. 250.

Drimys Winteri.

A large forest *tree*. *Branches* often tuberculated from the scars of the old footstalks. *Sepals* two to three, green. *Petals* seven, milk-white. *Fruit* ovate. (See Solander's *Med. Observ. and Inq.* vol. v. p. 41.)

Hab.—Straits of Magellan, Chili, Peru, New Granada.

Description.—Winter's bark (*Cortex Winteri* seu *Winteranus*) occurs in quills or rolled pieces, commonly a foot long, one or two inches in diameter, and two or three lines thick. Its colour externally is pale-yellowish, or dull reddish-gray, with red elliptical spots; internally it is reddish-brown. Its odour is aromatic, its taste warm and pungent. The characters by which it is distinguished from Canella bark have been already pointed out (see p. 644). Its infusion is darkened by the salts of iron.

Composition.—Winter's bark has been analyzed by M. Henry, (*Journ. de Pharm.* t. v. p. 489,) who found its constituents to be *resin*, *volatile oil*, *colouring matter*, *tannin*, *acetate of potash*, *chloride of potassium*, *sulphate of potash*, *oxalate of lime*, and *oxide of iron*.

1. Volatile oil (*Oleum Corticis Winteri*).—Pale yellow, lighter than water, with a very hot and acrid taste. By standing it is separated into two parts: one (the most abundant part) a greenish-yellow liquid; the other (heavier, but lighter than water) white, and of a fatty consistence.

2. Resin.—Reddish-brown, and almost odourless. Its taste is at first feeble; then acrid and persistent.

Physiological Effects and Uses.—Stimulant, aromatic, and tonic. Its uses are similar to those of cinnamon and canella alba. Winter employed it in scurvy. It is seldom employed.—Dose, 3ss. or 3j.

OTHER MEDICINAL MAGNOLIACEÆ.

ILLICIUM ANISATUM is an evergreen tree, growing in Japan and Cochin-China. Its fruit constitutes the *star-anise* (*anisum stellatum*) of the shops. It consists of a variable number (usually six to twelve) of hard woody follicles, disposed in a star-like form, each containing an oval reddish seed. It has the odour of common anise (*Pimpinella Anisum*), but somewhat sweeter. By distillation it yields the *oil of star-anise* (*oleum badiani*) which closely resembles, and is often substituted for, the oil of common anise (see p. 467); but it congeals less readily than the latter. Star-anise is aromatic and carminative. Both the fruit and the oil are employed by liqueur-makers. As regards its effects it might be substituted for common anise.

(MAGNOLIA GLAUCA, *Linn.*)

Magnolia, U. S. Sec. List.

This is usually a small tree, the height of which varies from 10 to 30 feet branching, with a smooth, glaucous, whitish bark. The *leaves* are from three to five inches long, and an inch and a half to two inches wide, nearly elliptical, rather acute, sometimes obtuse, shining green above, very glaucous beneath, and when young, the under surface clothed with a glaucous, silky pubescence. *Petioles* three-quarters of an inch long. *Flowers* very fragrant, on thick, clavate, pubescent peduncles, about half an inch in length. *Sepals* oblong, concave, roughish, dotted, as long as the petals. *Petals* white, an inch or an inch and a half long, obovate. *Stamens* numerous; *filaments* short, with the point extending above the adnate anthers. *Ovaries* collected in an ovoid cone; *styles* very short, recurved. *Carpels* opening longitudinally. *Seeds* obovate, covered with a purple fleshy arillus, falling out of the carpels when mature, and hanging for some time by a long filiform funiculus. (*Darlington, Flora Cestrica.*) *Sex. Syst. Polyand. Polygyn.*

FIG. 251.

This plant is abundant along the Atlantic coast, from Massachusetts to Florida, where it frequents thick swamps and morasses; it does not grow spontaneously in dry and argillaceous ground unless transplanted. It is readily detected when in bloom by the rich perfume of its handsome white flowers; this occurs in May and June. The glaucous leaves and white shining bark at other seasons serve to distinguish it from the trees with which it grows. In the southern states it is called *White Bay* and *Sweet Bay*. The bark is taken off during the spring and summer. When dried it is in pieces several inches in length, and an inch or two broad, somewhat rolled, light; ashen, smooth and silvery externally, white and fibrous internally. It has an aromatic odour, which is impaired by time, and a taste warm, pungent and bitterish. The bark of the root has similar sensible properties, and is regarded as being superior to that of the trunk and branches; it is rough externally. No detailed account has been given of its chemical composition; it is probable that an active principle, similar to *Liriodendrine*, found in the *M. grandiflora*, by Mr. Stephen Procter, (*Am. Journ. of Pharm.* vol. xiv. p. 95,) is also to be found in this species. Magnolia is tonic and diaphoretic in its effects on the animal economy, and may be used in cases where these effects are available. Its employment has been beneficial in the treatment of chronic rheumatism, and has proved serviceable in arresting the paroxysms of intermittent fever. The dose is ʒss. to ʒi. in powder; or a decoction may be made in the proportion of ʒi. to Oj.—Dose, ʒi. or ʒij. An infusion in brandy is sometimes used in rheumatism.

The M. ACUMINATA, *Cucumber Tree*, officinal in U. S. P. is a large tree, inhabiting the mountainous districts of the United States; and the M. TRIPETALA, (*Umbrella Tree*,) also officinal, is a much smaller tree. The bark of both afford the officinal drug in common with the preceding. The uses are the same.

The MAGNOLIA GRANDIFLORA is deserving of a similar rank. Mr. S. Procter (*op. cit.*) found the bark to contain *green resin*, *volatile oil*, and a peculiar *crystallizable principle* analogous to *Liriodendrine*, an *acid* precipitating the salts of iron green, and *salts*.

(LIRIODENDRON TULIPIFERA, *Linn.*—AMERICAN POPLAR. TULIP TREE.)

(Liriodendron, U. S. Sec. List.)

This tree is one of the handsomest, peculiar to the United States. Its height varies from 60 to 100 feet, and it is often four or five feet in diameter. In the old trees the branches are spreading at the summit, and frequently of great height without branches; in the young trees the branches are in the form of a cone. *Buds* large, compressed, obovate. *Leaves* three to five inches long, and four to six inches broad, nearly quadrangular in their outline, smooth, shining green above, paler beneath, rounded or subcordate at base, with a short, diverging, acuminate lobe (sometimes two) on each side, and the broad central lobe emarginately truncated. *Petioles* two to three inches long. *Flowers* large, campanulate, each with two caducous *bracts* at base. *Sepals* obovate-oblong, concave, pale yellowish green, as long as the petals, spreading, and at length reflexed, deciduous. *Petals* lance-obovate, mostly obtuse, greenish-yellow, stained with reddish orange below the middle. *Stamens* in a simple series, shorter than the petals; *filaments* with a lance-ovate point extending above the long adnate anthers. *Ovaries* closely imbricated; *stigmas* sessile, recurved. *Carpels* two-celled, samara-like, with a lance-oblong wing at apex, incurved at base, with a prominent internal ridge, imbricated in a cone upon a slender fusiform receptacle; one of the cells frequently obliterated, and both seeds often abortive. (Darlington, *Flor. Cest.*) *Sex. Syst. Polyand. Polygyn.* It is called *Tulip Tree* on account of its numerous large, showy, orange-coloured, tulip-shaped flowers. According to *Michaux* the northern limit of this tree may be placed at the southern extremity of Lake Champlain, lat. 45, and it seldom is found east of the Connecticut River. It is found abundantly through the middle and southern states, requiring a rich, not too moist, soil.

FIG. 252.

The bark of the trunk and larger branches is very rough, and covered with dead epidermis, which is very much split and divided; upon the smaller branches it is smooth, and of a deep ashen hue. It is brought into the market in pieces of three or four inches long, deprived of epidermis, and of a yellowish-white colour, light, fibrous, and easily broken; the odour is somewhat aromatic; the taste pungent, aromatic, slightly camphorous, and bitter. The article obtained from the root has similar sensible properties, but browner externally and rougher.

A peculiar principle (*Liriodendrine*) has been obtained from this bark by the late Prof. Emmet, of the University of Virginia. (*Journ. of Phil. Col. of Pharm.* vol. iii. p. 5.) It is a crystalline solid, bitter and inodorous at 40°, fusible at 180°, and volatile at 290° F. When carefully heated in a glass tube closed at one end, it gives off a white vapour, which condenses again, without signs of crystallization. It is not acid or alkaline. Its discoverer regarded it as a substance analogous to camphor.

The medical properties of Liriodendron are those of a stimulant and tonic;

in large doses it is diaphoretic, and is also stated to be diuretic. As a febrifuge it has been employed by a number of American physicians; but as it is stimulant, and apt to sicken the stomach, or to act upon the bowels, the condition of the organs is to be strictly inquired into, and the system prepared for its employment. Dr. Young regarded it as also beneficial in hysteria, and as an anthelmintic. The dose in substance is ℈i. to ℥ij. In this form it acts with most power. As it yields its virtues to water and alcohol, it may be exhibited either in infusion, decoction, or tincture. There are no officinal preparations.—J. C.

Order LXXXIV.—RANUNCULACEÆ, *De Candolle*.—THE CROW-FOOT TRIBE.

Essential Character.—*Sepals*, three to six, hypogynous, deciduous, generally imbricate in æstivation, occasionally valvate or duplicate. *Petals* three to fifteen, indefinite in number, hypogynous. *Petals* three to fifteen, hypogynous, in one or more rows, distinct, sometimes deformed. *Stamens* definite or indefinite in number, hypogynous; anthers adnate. *Carpels* numerous, seated on a torus, one-celled or united into a single many-celled pistil; *ovary* one or more seeded, the *ovules* adhering to the inner edge; *style* one to each ovary, short, simple. *Fruit* either consisting of dry akenia, or baccate with one or more seeds, or follicular with one or more valves. *Seeds* albuminous; when solitary, either erect or pendulous; *embryo* minute; *albumen* corneous.—*Herbs*, or very rarely *shrubs*. *Leaves* alternate or opposite, generally much divided, with the petiole dilated and forming a sheath half clasping the stem. *Stipules* occasionally present. *Hairs*, if any, simple. *Inflorescence* variable (*Lindley*).

Properties.—Mostly poisonous. Acridity is the prevailing quality, conjoined, in a considerable number of instances, with a narcotic quality. Several of the species are topical benumbers.

1. RANUN'CULUS A'CRIS, *Lind. D.*—UPRIGHT MEADOW CROWFOOT.

Sex. Syst. Polyandria, Polygynia.

(Folia, *D.*)

Botany. **Gen. Char.**—*Calyx* of five sepals; sepals not separate at the base, deciduous. *Petals* five, rarely ten, with nectariferous scales at the base. *Stamens* and *ovaries* numerous. *Caryopsides* ovate, somewhat compressed, terminating in a short mucro or horn, scarcely larger than the seed, smooth, striated or tuberculated, arranged in a globose or cylindrical head, (De Cand.)

Sp. Char.—*Calyx* spreading. *Flower-stalks* round and even. *Leaves* in three deep-lobed and cut segments; those of the uppermost linear and entire. *Stem* erect, covered with close hairs. (Smith, *Eng. Fl.*)

Perennial. *Flowers* yellow. *Petals* with a scale at the base.

Hab.—Indigenous; very common in meadows and pastures. Flowers in June and July.

Composition.—Not analysed. Its *acrid principle* is either very volatile, or readily undergoes decomposition, as, by drying, the plant loses its acridity.

Physiological Effects.—A powerful acrid. Inflammation of the palm of the hand has been produced by pulling it up and carrying it a little distance. (Curtis, *Fl. Lond.* vol. i.) Withering (*Arrang. of Brit. Plants*, iii. 681) says it easily blisters the skin. Orfila (*Tox. Gén.*) has shown, by experiments on animals, its power of causing inflammation of the tissues to which it is applied.

Uses.—It has been applied as a rubefacient and epispastic, but is far inferior to cantharides and mustard, on account of the uncertainty of its operation.

2. RANUN'CULUS FLAM'MULA, *Linn. D.*—LESSER SPEAR-WORT. CROWFOOT.

Sex. Syst. Polyandria, Polygynia.

(Herba recens, *D.*)

Botany. **Gen. Char.**—See *Ranunculus acris*.

Sp. Char.—*Leaves* ovate-lanceolate, bluntish stalked. *Stem* reclining. *Root* fibrous. *Seeds* smooth (Smith).

Perennial. *Leaves* nearly entire, subserrate. *Flowers* bright gold colour.

Hab.—Indigenous; sides of lakes and ditches abundant.

PHYSIOLOGICAL EFFECTS AND USES.—Similar to those of *Ranunculus acris.*

3. HELLEB'ORUS NI'GER, *Linn. E. D.*—BLACK HELLEBORE, OR CHRISTMAS ROSE.

Sex. Syst. Polyandria, Polygynia.

(Root, *E.*—Radix, *D.*)

(Helleborus, U. S.)

HISTORY.—According to Sprengel (*Hist. Rei Herb.* i. 226) this is the plant called by the Abbess Hildegard, *Christiana.*

It must not be confounded with the ἑλλέβορος μέλας (*black hellebore*) of Dioscorides, (Lib. iv. cap. 151,) which, according to Dr. Sibthorp, (*Fl. Græca,*) was the plant which he has described and figured under the name of *Helleborus officinalis.* Hippocrates employed hellebore in medicine. Melampus employed it with great success in the treatment of madness, 1400 years before Christ. His use of it is the earliest instance on record of the use of a purgative. (Le Clerc, *Hist. de la Méd.* p. 27, 1729.) It has been called after him *melampodium*, a term which has also been applied to Helleborus niger.

I cannot understand what circumstance can have induced the *London College* to adopt the *Helleborus officinalis*, Sibth., a native of Greece, as the source of the hellebore root of the shops, which comes from Germany. That it is an error cannot be for a moment doubted. Even the authors of the *Pharmacopœia Græca*, 1837, adopt the Helleborus niger, though they also refer to the H. officinalis.

BOTANY. **Gen. Char.**—*Calyx* persistent, of five sepals; sepals roundish, obtuse, large, usually green. *Petals* 8 to 10, very short, tubular, narrow, and nectariferous beneath. *Stamens* 30 to 64. *Ovaries* 3 to 10. *Stigmas* terminal, orbicular. *Capsules* coriaceous. *Seeds* in a double row, elliptical, umbilicated. (De Cand.)

Sp. Char.—*Leaves* radical, pedatisect, quite smooth. *Scape* leafless, one to two-flowered, bracteate. (De Cand.)

Rhizome several inches long, tuberculated, horizontal, scaly, blackish brown externally, white internally, with many dependent, long, simple root-fibres. *Leaves* on cylindrical stalks from four to eight inches long; lobes ovate-lanceolate, serrate near the point. *Scape* shorter than the petiole. *Sepals* ovate or roundish, large, white, slightly tinged with pink, eventually becoming green. *Petals* green, tubular, shorter than the stamens. *Follicles* many seeded. *Seeds* black, shining.

Hab.—Sub-alpine, woodland regions in the midland and southern parts of Europe.

COMMERCE.—Hellebore root is imported in barrels and bags from Hamburgh usually, but sometimes from Marseilles.

DESCRIPTION.—The root met with in commerce under the name of black hellebore root (*radix hellebori nigri*; seu *radix melampodii*) consists of two parts—the rhizome or rootstock, and the fibres which arise from it. The rhizome is half an inch or less thick, several inches long, horizontal or contorted, knotty, with transverve ridges and slight longitudinal striæ. The fibres are numerous, cylindrical, dark brown externally, internally whitish or yellowish white, with a central paler cord. The odour is very feeble, and scarcely perceptible, but has been compared to that of senega root. Its taste is slight at first, then bitterish, acrid, and nauseous.

SUBSTITUTION.—It is probable that the roots of *Helleborus viridis* and *fœtidus* are sometimes substituted for, or intermixed with, black hellebore root. This practice certainly occurs on the continent. The root of *Actæa spicata* (some-

times called *radix hellebori nigri falsi*) is also said to be occasionally substituted for the genuine root: its stronger fibres, when cut transversely, present the form of a cross. As far as I have observed, the roots, sold in this country as black hellebore, have a very uniform appearance, and from this I have not had reason to suspect any intermixture of other roots.

Composition.—Vauquelin (*Ann. de Muséum*, viii. 87) analysed the root of *Helleborus hiemalis*. This analysis is quoted by Soubeiran (*Nouv. Traité de Pharm.* i.) as the analysis of black hellebore root. Feneulle and Capron (*Journ. de Pharm.* viii. 503) analysed the black hellebore root.

Vauquelin's Analysis.	*Feneulle and Capron's Analysis.*
Very acrid oil.	Volatile oil.
Extractive.	Fatty oil.
Starch.	Volatile acid.
Vegeto-animal matter.	Resinous matter.
Sugar.	Wax.
Lignin.	Bitter principle.
	Ulmin.
	Galate of potash.
	Ammoniacal salts.
Root of Helleborus hiemalis.	Root of Helleborus niger.

Acrid Oil, Vauquelin; (*Soft Resin*, Gmelin; *Helleborin*).—This substance is odourless, has an acrid taste, and is soluble in spirit. Vauquelin ascribed the activity of hellebore to it. Feneulle and Capron, on the other hand, ascribe it to a combination of *fatty oil* and *volatile acid*. Probably the two latter correspond to the acrid oil of Vauquelin.

Physiological Effects. *α. On Animals.*—Given by the mouth to the carnivora (as dogs), it causes vomiting, frequently purging and griping. In excessive doses it produces gastro-enteritis. If the œsophagus be tied, to prevent the ejection of the root from the stomach, it causes staggering, weakness or paralysis of the hind extremities, insensibility, and death. Similar effects result from its application to a wound. (Orfila, *Toxicol. Gén.*; Schabel, quoted by Wibmer, *Wirk. d. Arzneim. u. Gifte*. Bd. iii. 11.) Orfila states, when the animals survive a few hours, inflammation of the rectum is a constant occurrence; whereas Vicat (*Hist. des Plant. Vén. de la Suisse*, p. 69,) says it causes inflammation of all the intestines, except only the rectum: the latter statement is entirely erroneous.

β. On Man.—Black hellebore is a local irritant, drastic purgative, and emmenagogue. Given in *small doses* it increases the secretion and peristaltic motion of the intestines, and acts as a stimulant to the pelvic circulation, thereby promoting the menstrual and hemorrhoidal discharges, and by its influence over the portal circulation contributing probably to increase the hepatic secretion. *Large doses* act as a drastic purgative, and frequently also occasion sickness. They produce a more manifest influence over the pelvic vessels, often cause cold sweats, and lower the strength of the pulse. In an *excessive* or *poisonous dose* it acts as a narcotico-acrid poison, and causes vomiting, purging, burning pain in the stomach and intestines, cramps of the lower extremities, cold sweat, faintness, paralysis, insensibility, and death. The fresh root *applied to the skin* produces rubefaction and vesication.

As a drastic purgative it is allied to colocynth (see p. 511), from which its narcotic operation and its greater influence over the pelvic organs distinguish it.

Uses.—Black hellebore, though greatly esteemed by the ancients, is but little employed by the moderns. It is adapted for torpid, phlegmatic individuals, especially when the pelvic circulation is languid. On the other hand, in easily-excitable persons, and where any irritation of the pelvic organs (especially the uterus and rectum) exists, it proves injurious.

1. *In affections of the nervous system*, especially mania, melancholia, and epilepsy, it has long been celebrated, and under the above-mentioned conditions, at times proves serviceable.

2. *As an emmenagogue* it was greatly esteemed by Dr. Mead, (*Works*, p.

563, 1762,) and is still much valued by some practitioners. He gave two tea-spoonsful of the tincture in a glass of warm water twice a day. The remarks already made will readily suggest the class of cases to which it is applicable.

3. *In dropsy* its drastic operation renders it useful. Furthermore, when this disease depends on, or is connected with, a languid state of the portal circulation, black hellebore proves further useful by the stimulus which it communicates to the hepatic vessels.

4. Lastly, black hellebore has been used in *chronic skin diseases*, and as an *anthelmintic*.

Administration.—The dose of powdered hellebore is from grs. x. to ℈j. as a drastic purgative. When we require a milder effect, we may give it in doses of grs. iij. to viij. It has also been given in decoction; but the tincture is the most frequently employed preparation.

1. TINCTURA HELLEBORI, L. (U. S.); *Tincture of Black Hellebore.*—Hellebore, bruised, ℥v.; Proof Spirit, Oij.—Macerate for fourteen hours, and strain.) —[Hellebore, bruised, four ounces; Diluted Alcohol, two pints. Proceed as above, or by displacement, U. S.]—Dose, f℥ss. to f℥j. Principally employed as an emmenagogue.

[2. EXTRACTUM HELLEBORI, U. S. *Extract of Black Hellebore.* (Hellebore, in coarse powder, a pound; Diluted Alcohol, four pints. Moisten with half a pint of the diluted Alcohol, and allow to stand for twenty-four hours, then displace in a percolator with the remainder of the Alcohol, and displace the last quantity with water. Distil off the Alcohol, and evaporate to the proper consistence.) This extract is not liable to the objection that may be urged against one prepared by decoction, as the volatile constituent is retained. It may be used for the same purposes as the preceding preparation.—Dose grs. v. to ℈j.—J. C.]

2. DELPHIN'IUM STAPHYSA'GRIA, *Linn. L. E. D.*—STAVESACRE.

Sex. Syst. Polyandria, Trigynia.

(Semina, *L. D.*—Seeds, *E.*)

History.—Hippocrates employed stavesacre in medicine. Sibthorp (*Prodr. Fl. Græcæ*, i. 372,) found the plant growing in Crete and Zante, and identified it with the σταφὶς αγρία of Dioscorides. (Lib. iv. cap. 156).

Botany. **Gen. Char.** — *Calyx* deciduous, petaloid, irregular; the *sepals* elongated at the base into a spur. *Petals* four, the two upper appendiculated within the spur (De Cand.)

Sp. Char.—*Spur* very short. *Bractlets* inserted at the base of the pedicel. *Petioles* pilose. *Pedicels* twice as long as the flower (De Cand.)

A stout *herb*, one or two feet high. *Stem* and *petioles* hispid, with soft hairs. *Leaves* broad, palmated, stalked, five to nine-cleft. *Racemes* lax. *Flowers* bluish or purplish. *Capsules* three, large.

Hab.—South of Europe, the Levant, and the Canaries.

Description.—Stavesacre seeds (*semina staphisagriæ* seu *staphidis agriæ*) are irregularly triangular (sometimes quadrangular), slightly arched, blackish-brown, and wrinkled. They contain a white and oily nucleus. Their odour is slight but disagreeable; their taste bitter, very acrid, hot, and nauseous. Iodine colours the seeds brown. Their watery infusion is darkened by sesquichloride of iron. Infusion of nutgalls renders it turbid.

Composition.—Stavesacre seeds were analyzed in 1820 by Brandes, (Gmelin, *Handb. d. Chem.* ii. 1240,) and in 1821 by Lassaigne and Feneulle. (*Ann. de Chim. et de Phys.* xii. 358.)

Brande's Analysis.		*Lassaigne and Feneulle's Analysis.*
Delphina	8·10	Malate of delphinia.
Fatty oil	19·10	Volatile oil.
Waxy substance	1·40	Fatty oil.
Gum	3·15	Brown bitter matter.
Starch	2·40	Yellow ditto.
Woody fibre	17·20	Uncrystallizable sugar.
Phytocol *with salts*	30·67	Gum.
Vegetable albumen	3·70	Woody fibre.
Sulphates and phosphates of lime, potash and magnesia	5·77	Animal matter.
Water	10·00	Albumen.
		Mineral salts.
Stavesacre seeds	100·49	Stavesacre seeds.

1. Delphinia (*Delphina; Delphine; Delphinum*).—As usually met with, this is a white, odourless powder. Its taste is extremely acrid and very bitter. It fuses at 248° F. It is scarcely soluble in water whether hot or cold, but dissolves in ether, and still better in alcohol. Its alcoholic solution reacts as an alkali on test paper. It is not crystallizable, though its texture is said to be crystalline, when the powder is moistened. It saturates acids, forms salts which are acrid, very bitter and difficultly crystallizable. From its solution in acids it is precipitated by alkalis. Its composition is C^{27} H^{19} N O^{2}. Its atomic weight, therefore, is 211. Couerbe (*Journ. de Pharm.* xiii. 365,) says that, as usually procured, it is not absolutely pure, but contains a resinous matter, and an acrid resin which he calls *staphysain*.

2. Volatile Acid (*Delphinic Acid ?*).—Discovered by Hofschläger. (*Ann. Chim. et de Phys.* l. ii.) It is white, crystalline, volatile at a low temperature, and in small doses is a powerful emetic.

Physiological Effects.—The activity of stavesacre seeds depends partly on the delphinia and partly on the volatile acid. The powder of the seeds readily excites nausea, vomiting, and purging. Orfila (*Toxicol. Gén.*) has shown that, on dogs, it acts first as an acrid, and afterwards as a narcotic poison. Its operation appears to be similar to cebadilla (see p. 99).

Uses.—Stavesacre seeds have been used to destroy pediculi, whence the Germans term them *Läusesaamen*, or *louse-seeds*. For this purpose they are employed in the form of ointment or acetous infusion. They have also been administered internally (in doses of from three to eight grains) against worms, and externally in the form of decoction (prepared by boiling ℥j. of the seeds in Oij. of water) in inveterate itch.

Antidote.—See *Veratrum album*.

DELPHINIA.—Four grains of delphinia dissolved in a drachm of rectified spirit produce, when rubbed on the skin, a sensation of burning and prickling, with tingling, and slight redness. Taken internally, in doses of half a grain, it sometimes acts slightly on the bowels, and increases the flow of urine. In larger doses, as a few grains, it gives rise to sensations of heat and tingling in various parts of the body. (Turnbull, *Treat. on Pain. and Nerv. Dis.* p. 78, 1837.) The diseases in which it is chiefly successful are neuralgic cases. It has also been used in rheumatic affections with some benefit. It is employed externally in the form of ointment or alcoholic solution. The *unguentum delphiniæ* consists of ℥ss. of delphinia, ℥j. of olive oil, and ℥j. of lard. The *solutio delphiniæ*, composed of ℈j. of delphinia dissolved in f ℥ij. of rectified spirit, is an excellent embrocation. Internally, delphinia is given in the form of pills. The *pilulæ delphiniæ* consist of gr. j. of delphinia; gr. xij. extract of hyoscyamus; and the same quantity of extract of liquorice; divide the mass into twelve pills, one of which may be taken every three hours (Turnbull).

3. ACONI'TUM NAPEL'LUS, *Linn. E.*—COMMON WOLFSBANE OR MONKSHOOD.

Sex. Syst. Polyandria, Trigynia.

(Leaves, *E.*)

(Aconitum, U. S.)

History.—The ancient history of Aconite is involved in great obscurity. The Greeks make frequent reference to a most virulent poison which they term ἀκόνιτον. Theophrastus (*Hist. Plant.* ix. 16,) is the earliest writer who speaks of it. As *Aconitum Napellus* is a virulent poison, and is a native of Greece,

where it is known at the present day as ἀκόνῖτον, (*Prod. Fl. Græcæ*, i. 372,) it would at first appear probable that our common aconite was the plant referred to by the ancient Greeks. But the characters of it as given by Theophrastus quite preclude this supposition; and I believe no one has been able to identify satisfactorily the plant described by this ancient naturalist. (Consult J. E. F. Schultze, *Toxicol. Vet.* p. xiii. 1788.) Dioscorides (Lib. iv. cap. 77 and 78,) has noticed two kinds of ἀκόνῖτον.

Botany. **Gen. Char.**—*Calyx* petaloid, irregular, deciduous or withering; upper sepal concave, helmet-shaped. *Petals* two, superior, (nectaries), on long stalks, expanded at the apex into a bag hidden beneath the helmet (De Cand.)

Sp. Char.—*Flowers* densely spiked or loosely panicled. *Helmet* semicircular, rarely boat-shaped. Bag of the *petals* somewhat conical. *Spur* short, thick, inclined. Wings of the *stamens* cuspidate or evanescent. Lobes of the *leaves* cuneate pinnatisect. *Ovaries* three, rarely five, smooth or pilose (De Cand.)

Perennial *herb*. *Root* tapering. *Stem* simple. *Flowers* blue.—This species is subject to great variation in the dense or loose condition of the inflorescence, in the form of the helmet, the colour and size of the flower, the breadth and the number of slashes of the leaves, the downiness of the parts of the plant, and the condition of the stem. De Candolle (*Prodr.* i. 62) admits no less than twenty-nine varieties.

Hab.—Europe. It is placed among indigenous plants, but it is a doubtful native.

The *Dublin College* has adopted *Aconitum paniculatum*, De Candolle, as the officinal species, and direct the leaves (*folia*) to be used.

The *London College* has followed the Dublin College, except that they direct the root (*radix*) as well as the leaves (*folia*) to be employed.

I confess myself unacquainted with any just grounds for this preference. The *Aconitum Napellus* is one of the most active species of the genus, and no good evidence has yet been adduced to prove its inferiority to the *A. paniculatum*, var.

γ. *Storkianum*, which Stork published as *A. Napellus officinalis*. Moreover, the roots of *A. paniculatum* are not found in commerce, nor is the plant grown (except in botanical gardens) in this country; so that druggists and apothecaries cannot, if they would, obey the directions of the London and Dublin Colleges.

Description.—Aconite root (*radix aconiti*), when fresh, consists of a tapering rootstock, placed perpendicularly, or nearly so, in the earth, and of numerous, cylindrical, fleshy fibres arising from it. At its upper and thickest part, the rootstock seldom exceeds the thickness of the finger; inferiorly it is attenuated and filiform. Sometimes two or three rootstocks are conjoined. In the latter case the root has a palmated appearance. Its total length is three or four or more inches. Its colour, as well as that of the fibres, is externally coffee brown; its odour is earthy. Internally it is white and fleshy. Its taste is bitter; but after a few minutes a remarkable numbness and tingling is perceived on the lips, tongue, and fauces. By drying, the root shrivels, and becomes darker coloured. The root should be gathered in the spring, just before the leaves appear. The *leaves* (*folia aconiti*), when chewed, have the same taste, and produce the same feeling of numbness.

Composition.—No complete analysis either of the root or the leaves of *Aconitum Napellus* has been made. The following are the constituents of the root of *A. Lycoctonum*, according to Pallas (*Journ. de Chim. Méd.* i. 192):—*A black oil, a green fatty matter, a substance having some analogy with the vegetable alkalis* [impure aconitina?], *vegetable albumen, starch, lignin*, and some *salts*.

The leaves of *Aconitum medium Schraderi* were analyzed by Bucholz. (Gmelin, *Handb. d. Chem.* ii. 1241.)

Both Brandes and Peschier announced the existence of a peculiar alkali (*aconitina*) in aconite. Their statement was confirmed in 1825, by Pallas, (*op. supra cit.*) and, in 1832, by Geiger and Hesse. (*Journ. de Chim. Méd.* x. 464.) Peschier also asserted that aconite contained a peculiar acid (*aconitic acid*).

His assertion has been substantiated by L. A. Buchner, jun. (*Pharm. Central Blatt für* 1838, S. 439.) It has been since ascertained that the same acid is developed by the action of heat on citric acid (see vol. i. p. 358). Most chemists have admitted the existence of *a volatile acrid principle* in aconite; but it has not hitherto been isolated.

1. Aconitina.—(See p. 745.)

2. Volatile Acrid Principle.—This principle, though admitted by several chemists, has not been isolated. Geiger (*ibid.* 1831, 491) submitted the fresh herb of Aconitum Napellus, with water, to distillation, and obtained a liquor having an acrid taste, an unpleasant odour, and whose emanations affected the eyes. May not this volatile principle be the product of the decomposition of aconitina? The following circumstances favour this suggestion:—1st. The fresh herb and root have little odour; 2dly, the local effect of aconitina is similar to that of the root and leaves; 3dly, aconitina, when mixed with the other constituents of the plant, readily undergoes decomposition, so that considerable nicety of manipulation is required in the extraction of it; and Mr. Morson tells me he has sometimes failed to obtain it.

3. Aconitic Acid.—In the evaporation of the juice of aconite, octohedral crystals of *aconitate of lime* are frequently deposited. From these L. A. Buchner obtained the acid. The acid also exists in *Equisetum fluviatile*, and may be formed by the action of heat on citric acid (see vol. i. p. 358.) As obtained from Aconite it is scarcely crystalline, merely forming warty elevations. It is white, permanent in the air, odourless, very sour, and is very soluble in water, alcohol, and ether. When heated it fuses, but at the same time undergoes decomposition; but does not yield fumaric acid. From the latter acid it is distinguished by its greater fusibility and solubility; from malic acid by its forming indistinct crystals, and not yielding fumaric acid by heat. The anhydrous acid, as found in aconitate of silver, consists of $C^4 H^1 O^5$.

4. Fatty Oil.—This is extracted from the root by alcohol. It is dark coloured. All the specimens of it, which I have obtained, possess a powerfully benumbing property [from the presence of aconitina?].

Physiological Effects.—Hitherto I have met with no clear and accurate account of the effects of aconite, and some of them appear to me to have been entirely overlooked.

α. On Animals.—If a small quantity of the soft alcoholic extract of the root of aconite be introduced into a wound (as into the cavity of the peritoneum) in a dog, it usually causes vomiting (sometimes of a stercoraceous character), diminishes the force of the circulation, weakens the muscular system so as sometimes to cause the animal to stagger in walking, and destroys common sensibility of feeling, without causing stupor. A dog under the influence of not too strong a dose, will sometimes follow its owner around the room, recognize him by wagging his tail when called, and yet be totally insensible to pinching, pricking with needles, &c. Convulsions do not usually occur until a short period before death, and they are then commonly slight, and rather to be termed spasmodic movements. I have repeatedly demonstrated these effects to the pupils attending my lectures.

The following is a notice of one experiment:—

March 31, 1837; London Hospital. Present Mr. Adams, and several medical students.—A small portion of alcoholic extract of aconite was introduced into the peritoneal sac of a strong dog, who had been kept fasting for some hours. In a few minutes he was evidently affected. He was less capable of supporting himself, and leaned against a wall. In ten minutes was insensible to the pain caused by the introduction of pins into his legs, paws, body, tail, nose, &c. His sight, however, was unaffected; at least he winked as usual when attempts to strike him were feigned. Was not paralytic, for he walked, though not firmly. He recognised several individuals, and wagged his tail when spoken to. He made violent attempts to vomit. He then laid down, became apparently weaker, and died without a single convulsion. At one period the action of the heart was slower than usual, and the first and second sounds of the heart were unusually clear and distinct. Subsequently the circulation was quickened. Respiration was not disordered; nor were the bowels affected.

I have subsequently found that if a large quantity of alcoholic extract be used, the loss of feeling is not so well-marked; for death succeeds in so short a period of time that the loss of feeling, as distinguished by the insensibility immediately preceding death, is not well observed. For the same reason, rabbits do not answer well for demonstrating these effects; and the weakness (paralysis?) of the hind extremities, and spasmodic movements, are much more marked in them

than in dogs. I can distinguish no difference between the effects of Aconitum Napellus on rabbits, and those of Aconitum ferox on the same animals.[1] On opening the bodies of dogs killed by aconite, immediately after death, no pulsations of the heart are visible.—Want of space compels me to abstain from entering into any details respecting the experiments made on animals with aconite by Wepfer, (*Hist. Cic. Aq.* 1733), Sprœgel, (Wibmer, *Wirk. d. Arzneim. u. Gifte.* Bd. i. S. 33), Viborg, (*Ibid.* S. 34), Brodie, (*Phil. Trans.* for 1811, p. 178), and Orfila, (*Toxicol. Gen.*)

β. On Man.—The *topical effects* are peculiar and most remarkable. If a leaf or a small portion of the root be chewed, or a few drops of the alcoholic tincture of the root be applied to the lips, there are produced in a few minutes numbness and a remarkable tingling sensation. These effects endure for many hours. If the quantity taken into the mouth be somewhat larger, the palate and throat are affected. To me the sensation appears as if the velum and soft palate were elongated, and resting on the dorsum of the tongue. To relieve this, frequent attempts are made to swallow.

When *small and repeated doses* of the *alcoholic tincture* of the root are taken internally, they cause a sensation of heat and tingling in the extremities, and occasionally a slight diuresis.

The *extract of aconite* of the shops is but little to be relied on. Many samples produce neither numbness nor tingling when rubbed on the lips and gums. Störck (*Essay on the Internal Use of the Thorn-Apple, Henbane, and Monkshood*, Lond. 1763), states that it acts as a diaphoretic and diuretic. These symptoms, however, are by no means constantly produced, and, when they occur, are not always clearly referrible to the aconite used.

In *poisonous doses* the effects of aconite are most remarkable. The following details of the effects produced on a family of three persons were furnished me, a few days after the accident, by one of the sufferers (Mrs. Prescott), and her account was confirmed by a very intelligent neighbour who witnessed the progress of the symptoms:—

In December, 1836, Mr. Prescott, aged 58, residing in the City Road, planted in his garden a few pieces of horse-radish. On February 5th, 1837, he observed some green shoots, which he supposed to be those of horse-radish. He dug up three of them. The roots, (samples of which were given, and have yielded me thriving plants of Aconitum Napellus) were tap shaped and small. Perhaps a very small walnut would exceed in bulk that of the whole root. These roots were washed, scraped, placed on a plate with some vinegar, and eaten at dinner (at two o'clock) with roast-beef, by Prescott, his wife (aged 57), and a child (aged 5). It was remarked at dinner that the root was very mild, and had not the pungency of horse-radish. After the family had dined, about one root was left; so that two had been eaten at dinner, the greater part (perhaps one or one and a half roots) by the husband. About three-quarters of an hour after dinner, Mr. Prescott complained of burning and numbness of the lips, mouth, and throat, and which soon extended to the stomach, and was accompanied with vomiting. The matters ejected were first his dinner, and afterwards a frothy mucus; but at no time was any blood brought up. The vomiting was very violent and constant for an hour, and continued more or less until within half an hour of his death. An emetic was swallowed at a quarter past four o'clock; and therefore the subsequent vomiting may be ascribed, in part at least, to this. His extremities were cold, but his chest was warm; the head was bathed in a cold sweat. His eyes, to use the expression of his neighbour, were "glaring." He complained of violent pain in the head, and trembled excessively. The last symptom might, perhaps, be in part owing to his terror of the mistake he had committed. The lips were blue. His mental faculties were not disordered: on this point I made particular inquiry, and I was assured that he was neither delirious nor sleepy, but was quite conscious until within two minutes of his death. He had no cramp, spasm, or convulsion; the only approach to it was trembling. He frequently put his hand to his throat. Though exceedingly weak he did not lose his power over the voluntary muscles; for within a few minutes of his death he was able, with the assistance of his neighbour, to walk to the water-closet. His bowels were acted on once only after dinner, and that on the occasion just mentioned, which was about an hour after he had taken the emetic and some castor oil. His breathing was apparently unaffected. On his return from the water-closet he was

[1] See the results of my experiments on the latter plant, in the splendid work of my friend Dr. Wallick, *Plantæ Rariores Asiaticæ*; also a detail of my experiments in the *Edinb. Journ. of Nat. and Geogr. Science*, July 1830, p. 235.

put to bed, and within a few minutes expired, apparently in a fainting state. Death occurred about four hours after dinner.

Mrs. Prescott was affected in a similar way. She had the same burning and numbness of the lips, mouth, throat, and stomach, and violent vomiting. She experienced a curious sensation of numbness in the hands, arms, and legs; and she lost the power of articulating, so that she was unable to tell the address of her son. Her attempts to speak were attended with unintelligible sounds only. She experienced great muscular debility, and was unable to stand. In this respect her condition differed from that of her husband, who could both stand and walk. She felt stiffness of, and difficulty in moving, her limbs. She had no cramps, spasms, or convulsions. The only approach thereto was the stiffness of the muscles when she attempted to put them in action, as in her attempts to wipe her face. Some of the external senses were disordered: thus, to use her expression, though her eyes were wide open, her sight was very dim, and surrounding objects were seen indistinctly. The hearing was unaffected. The sensibility of the body was greatly impaired; her face and throat were almost insensible to touch. She felt very giddy, but was neither delirious nor sleepy. For the most part she was conscious, but at times scarcely knew what was passing around her. Her body and extremities were cold. She was frequently pulling her throat about, but she knew not why. Five or six hours after dinner she began to recover, and her natural warmth returned. The remedies employed were an emetic, castor oil, pediluvia, rum and water, and some "warm" medicine given her by a neighbouring practitioner.

The child was similarly but more slightly affected, except that she evinced a slight tendency to sleep. Like the others she was constantly putting her hands to her throat.

Mr. Sherwen (*Lancet*, March 25, 1837, p. 13) has published a most interesting case of a female poisoned by the alcoholic tincture of the root. About five minutes after swallowing it, she was seized with a pricking and tingling down her arms and fingers, and a painful numbness across the wrists; the tongue and mouth next felt the same, then the legs and feet; and in less than ten minutes her face seemed to her feelings to be swelling, and the throat growing tight. She felt sick, made many efforts to vomit. Her legs failed, she was almost blind, but was conscious of her plight. When seen by Mr. Sherwen her eyes were fixed and protruded, with *contracted* pupils; countenance livid; jaws and fauces rigid; arms and hands quite cold and pulseless; the legs and trunk much in the same state; breathing short, imperfect, and laborious; while the heart fluttered feebly. She was sufficiently sensible to tell how the accident occurred. In an attempt to administer an emetic a strong convulsion occurred. Copious vomiting afterwards took place. Five hours after she had taken the poison the pulse was becoming full, only 58 per minute, and intermitting. There was less oppression at the præcordia, and the pupils were larger. She eventually recovered.

The cases now recorded agree with the one detailed in the *Philosophical Transactions*. (Vol. xxxviii. p. 287) Pallas (quoted by Christison) and Degland (*Journ. de Chim. Méd* iii. 344) have published cases in which violent vomiting, purging, colic, and abdominal tenderness, are said to have been produced by aconite [?]

In comparing the operation of aconite with that of other cerebro-spinants we observe that its most characteristic topical effect is *numbness and tingling*. Applied to the eye it causes *contraction of the pupil*. When the root or its tincture is swallowed, the most marked symptoms are *numbness and tingling of the parts about the mouth and throat, and of the extremities, vomiting, contracted pupil, and failure of the circulation*. The heart appears to be weakened or paralysed, and a state approaching to asphyxia is produced. *Convulsion* or *spasm* is not constantly present, and when it does take place, is probably a secondary effect arising from the incipient asphyxia. In neither of the cases which I have above detailed, nor in that of Mr. Sherwen, did *stupor* occur. Yet in some recorded instances it has happened. In such it probably depends, as Mr. Sherwen suggests, on the congested condition of the venous system of the brain brought on by the failure of the heart's action, and the consequent accumulation of blood on the right side of the heart.

Uses.—A knowledge of the physiological effects of aconite suggests the therapeutical uses of this medicine. A benumber is obviously the physiological remedy for increased sensibility (pain) of the nerves.

As a *topical remedy*, aconite is most valuable for the relief of neuralgic and rheumatic pains. In *neuralgia*, no remedy, I believe, will be found equal to it. One application of the tincture produces some amelioration, and, after a few times' use, it frequently happens that the patient is cured. In some cases the benefit seems almost magical. In others, however, the remedy entirely fails to give any permanent relief. Though the pathology of this disease be but little understood, yet we know that the causes of it, and the conditions under which it occurs, are by no means uniform. We are, therefore, easily prepared to believe, that while in some cases aconite may prove beneficial, in others it may be useless. I do not think that in any it proves injurious. The causes of neuralgia, are, however, usually obscure, and therefore we are, in most cases, not able to determine *à priori* the probability or the reverse of the beneficial agency of aconite. Hence its employment must be, for the most part, empirical. I have observed, that when it succeeds, it gives more or less relief at the first application. When the disease depends on inflammation, aconite will be found, I think, an unavailing remedy. In a painful affection of the nerves of the face, arising from inflammation of the socket of a tooth, it gave no relief. In *rheumatic pains*, unaccompanied with local swelling or redness, aconite is frequently of great service. In painful conditions of the intercostal, and other respiratory muscles, occurring in rheumatic individuals, I have found this remedy most valuable. In one case of *sciatica* it gave partial relief: but in most cases in which I have tried it, it has failed. In *lumbago* I have not tried it. Dr. Turnbull (See his *Treat. on Painf. and Nerv. Dis.* 1837) states that a lady was cured of this disease by the aconite ointment. In *acute rheumatism* its application has not proved successful in my hands; but I have been informed of cases occurring to others in which it has been of great service.

Aconite has been administered *internally* in various diseases, principally on the recommendation of Störck. (*Essay on the Int. Use of Thorn-Apple and Monkshood*, 1763.) It has been employed as a narcotic (anodyne) sedative, sudorific, resolvent, and diuretic. The diseases in which it has been employed are *rheumatism*, *gout*, *scrofula*, *phthisis*, *syphilis*, *some skin diseases*, *scirrhus* and *cancer*, *intermittents*, *dropsies*, *paralysis*, *epilepsy*, *amaurosis*, *uterine affections*, and *hypertropy of the heart*.

In the large majority of these maladies scarcely any practitioner now believes in its efficacy. Fouquier gave it very extensive trials without obtaining much relief from it, except as a diuretic in *passive dropsies*. In *rheumatism* it has frequently proved serviceable when combined with a sudorific regimen. I have seen it give great relief in rheumatic pains. In *hypertrophy of the heart* it has been recommended by Dr. Lombard, (*Brit. and For. Med. Rev.* i. 249,) on account of its decidedly sedative effects on the heart.

Administration.—The only preparations of aconite, whose activity may be relied on, are the *tincture* (made with rectified spirit), the *alcoholic extract*, and Morson's *aconitina*. The *powder* is given in doses of one or two grains, gradually increased, until some effects are produced. But no reliance can be placed on it. When of good quality, it causes numbness and tingling of the lips and tongue a few minutes after its application to these parts.

Antidotes.—See the treatment for poisoning by tobacco, p. 321. In Mr. Sherwen's case (*Treat. on Painful and Nerv. Dis.* p. 91, 1837,) great benefit was obtained by the abstraction of ten ounces of blood from the jugular vein.

1. TINCTURA ACONITI, (U. S.) *Tincture of Monkshood.* (Root of aconite, recently dried and coarsely powdered, lb. j.; Rectified Spirit, Oiss. Macerate for fourteen days and strain.) [Aconite, four ounces; Diluted Alcohol, two pints. Macerate for fourteen days and filter. Or, prepare by displacement. U. S.]—This formula is very nearly that given by Dr. Turnbull. (*Lancet*, March 25, 1837.) Its dose is five drops three times a day. It should be employed with great caution. As an embrocation in neuralgia and rheumatism it is invaluable.

It is applied by means of a sponge tooth-brush, or a small piece of sponge attached to the end of a stick. Mr. Curtis, of Camden Town, has suggested to me the use of an aconite plaster, prepared by spreading the soft alcoholic extract (obtained by evaporating the tincture) on adhesive plaster, in neuralgia.

2. EXTRACTUM ALCOHOLICUM ACONITI, (*Extractum Aconiti Alcoholicum*, U. S.) *Alcoholic Extract of Monkshood.* (Prepared by distilling the spirit from the tincture, until the consistence of an extract has been obtained.) [Aconite, lb. j.; Diluted Alcohol, Oij.; prepare a tincture by displacement; distil off the Alcohol and evaporate. U. S.]—It has been employed internally in doses of one-sixth of a grain every three hours. It should be given in the form of pills (*pilulæ aconiti*) made of liquorice powder and syrup. It may be also employed externally in the form of ointment (*unguentum aconiti*), composed of one part of the extract, and two parts of lard (Turnbull), or spread on adhesive plaster.

3. EXTRACTUM ACONITI, L. E. (U. S.) *Succus Spissatus Aconiti*, D. *Inspissated Juice or Extract of Monkshood.* (Fresh Aconite Leaves, lb. j. Having moistened the leaves with water, bruise them in a stone mortar: then press out the juice, and evaporate it, unstrained, to a proper consistence, *L. D.*—"Take of the leaves of monkshood, fresh, any convenient quantity; beat them into a pulp; express the juice; subject the residuum to percolation with rectified spirit, so long as the spirit passes materially coloured; unite the expressed juice and the spirituous infusion; filter; distil off the spirit, and evaporate the residuum in the vapour bath, taking care to remove the vessel from the heat so soon as the due degree of consistence shall be attained," *E.*)—An uncertain preparation. When of good quality it causes numbness and tingling, within a few minutes after its application, in the mouth and lips. The tincture or alcoholic extract are, in my opinion, greatly to be preferred to this variable preparation.—Dose, one or two grains at the commencement, and to be gradually increased until some obvious effect is produced.

4. ACONITINA, L. *Aconitine.* The following directions for making this alkaloid are given in the London Pharmacopœia:

"Root of Aconite, dried and bruised, lb. ij.; Rectified Spirit, *Cong.* iij.; Diluted Sulphuric Acid; Solution of Ammonia; Purified Animal Charcoal, each as much as may be sufficient. Boil the Aconite with a gallon of the Spirit for an hour, in a retort with a receiver adapted to it. Pour off the liquor, and again boil the residue with another gallon of the Spirit and the Spirit recently distilled, and pour off the liquor also. Let the same be done a third time. Then press the Aconite, and all the liquors being mixed and strained, let the Spirit distil. Evaporate what remains to the proper consistence of an extract. Dissolve this in water, and strain. Evaporate the liquor with a gentle heat, that it may thicken like a syrup. To this add of dilute Sulphuric Acid, mixed with distilled water, as much as may be sufficient to dissolve the Aconitina. Then drop in solution of Ammonia, and dissolve the Aconitina precipitated, in diluted Sulphuric Acid and water, mixed as before. Afterwards mix in the Animal Charcoal, frequently shaking them during a quarter of an hour. Lastly, strain, and solution of Ammonia being again dropped in that the Aconitina may be precipitated, wash and dry it.

Aconitina exists in the plant in combination with a vegetable acid (aconitic acid?). Alcohol extracts this salt with some other matters. The alcoholic extract yields this salt to the water, and on the addition of sulphuric acid a sulphate of aconitina is formed, which is decomposed by ammonia, and the aconitina precipitated. It is then again dissolved by sulphuric acid, the solution decolorized by charcoal, and the aconitina again precipitated by ammonia.

As prepared by Mr. Morson, this substance presents the following properties:—It is a white, odourless solid, either dull and amorphous or somewhat sparkling, and apparently crystalline. As it is usually described as being uncrystallizable, I have carefully examined a supposed crystalline mass with the microscope, but I could not detect distinct crystals. The fragments appeared like thin plates of chlorate of potash, and, though they varied greatly in shape, the triangular form seemed predominant. Heated in a tube, aconitina readily fuses, and forms a pale amber-coloured liquid; and at a higher temperature decom-

poses. It is not volatile. Heated on platinum foil over a spirit-lamp, it is speedily and entirely dissipated. It is soluble in alcohol, ether, and the acids. From its acid solution it is precipitated by ammonia. A minute portion of it mixed with lard, and applied to the eye, causes *contraction* of the pupil, as I have repeatedly seen. Geiger and Hesse state that the aconitina which they obtained produces *dilatation* of the pupil. Mr. Morson's aconitina is so powerful that one-fiftieth of a grain has endangered the life of an individual. It is the most virulent poison known, not excepting hydrocyanic acid.

The following are the notes appended to it in the London Pharmacopœia:

"An alkali prepared from the leaves and root of aconite. It is very soluble in sulphuric ether, less in alcohol, and very slightly in water. It is totally consumed in the fire, no salt of lime remaining. The substance possessing strong power, is not to be rashly employed."

A spurious aconitina is found in the shops. It is imported from France, and bears the stamp and label of a celebrated French chemical firm. Its colour is grayish-yellow. It is inert or nearly so; at least I have taken one grain of it without perceiving the least effect of it on the tongue or otherwise. It is not completely soluble in ether or alcohol. When burnt on platinum foil it leaves a calcareous residue. The only genuine aconitina which I have met with is that manufactured by Mr. Morson, of Southampton Row; and Dr. Turnbull informs me that he has found none other to possess any medicinal value. Mr. Skey also found this to be the case. (See *Lond. Med. Gaz.* xix. 185.)

The *effects* of this alkaloid are similar to those of aconite root, but, of course, much more powerful. If the ointment or alcoholic solution of this substance be rubbed on the skin, it causes intense heat, tingling, and numbness, which continue for more than twelve or eighteen hours. A minute portion of an ointment, composed of a grain of the alkaloid to two drachms of lard, applied to the eye, causes almost insupportable heat and tingling, and contraction of the pupil. This last effect was shown me by Dr. Turnbull, in some amaurotic cases of several years' standing, and whose pupils underwent no change when the eye was exposed to strong day-light. In very minute doses it has caused heat and tingling upon the surface of the body, and sometimes diuresis; but it cannot be administered internally with safety. In one case (an elderly lady), one-fiftieth of a grain had nearly proved fatal. Satisfied that great insecurity attends its internal use, Dr. Turnbull tells me he has long since ceased to employ it in this way, as the slightest inattention on the part of the dispenser may be attended with fatal results.

The enormous cost (3s. 6d. per grain!) of Morson's aconitina limits its use. I believe that the alcoholic tincture is a perfect substitute for it; and the experience of others confirms my own observation. Of the great efficacy of aconitina in neuralgic and rheumatic affections, no one can entertain any doubt who has submitted the remedy to trial. (See Dr. Turnbull, *op. supra cit.*; Mr. Skey, *Lond. Med. Gaz.* vol. xix. p. 181.) The following are Dr. Turnbull's formulæ for using aconitina externally:

1. *Unguentum Aconitinæ. Aconitine Ointment.* (Aconitine, gr. xvj.; Olive Oil, ℥ss.; Lard, ℥j. Mix.)—It is employed by friction, with the finger during several minutes.
2. *Solutio Aconitinæ. Aconitine Embrocation.* (Aconitine, gr. viij.; Rectified Spirit, ℥ij. Dissolve.)—Used by friction-sponge (as a sponge tooth-brush). Care must be taken not to employ it where the skin is abraded.

(4. CIMICIFUGA RACEMOSA.—BLACK SNAKEROOT.)

Sex. Syst. Polyandria, Monogynia.

(Cimicifuga, U. S. The Root.)

[BOTANY. **Gen. Char.**—*Sepals* four to five. *Petals* (or rather staminodia) three to five, concave or unguiculate, sometimes by abortion few or none. *Stamens* numerous: *anthers* retrorse. *Style* short: *stigma* simple. *Carpels* one

to eight, follicular, many-seeded. Perennial *herbs*. *Leaves* two to three, ternately divided, segments incisely serrate. *Flowers* in virgate racemes, white. Torrey and Gray, (*Flor. of North America.*)

Sp. Char.—*Racemes* very long; *leaflets* ovate oblong, incisely toothed; *staminodia* slender, two forked. (*Ell.* Sk. ii. p. 16.) *Root* thick and knotted, with long fibres. *Stem* three to eight feet high, glabrous, furrowed, leafy near the middle. *Leaves* three, ternate; *leaflets* two to three inches long. *Racemes* branching, six to twelve inches long; *pedicels* three to four lines in length, bracteate. *Flowers* very fetid. *Sepals* caducous, greenish-white, concave. *Staminodia* four to eight. *Carpels* globose ovate, glabrous. *Seeds* seven to eight, compressed and angular. De Candolle states that the flowers are sometimes digynous, but we have never observed more than a single ovary in a flower. (T. and G. *op. cit.* vol. i. p. 36.)

Hab.—This plant is known by the names of *Tall Snakeroot*, *Black Snakeroot*, and *Rich Weed*. Its size and the long white racemes of flowers make it a conspicuous ornament of our woods. It is abundant in open woods and on hill sides throughout the United States, from Canada to Florida. It flowers in June and July.

The root as found in the shops is composed of a rough tuberculated head and numerous radicles, several inches long, of a black colour externally, white internally. The radicles are extremely brittle and liable to be separated. The odour is feeble and earthy; the taste bitter and astringent, leaving an impression of acrimony upon the palate. The sensible properties depend upon the time when the root is collected, and the mode of drying and preserving it. Late in the summer or in the autumn it should be collected.

Composition.—An analysis made by Mr. Tilghman, resulted in the detection of the following substances:—*Fatty matter*, *gum*, *starch*, *resin*, *tannin*, *wax*, *gallic acid*, *sugar*, *oil*, *black colouring matter*, *green colouring matter*, *lignin*, and *salts of lime*, *iron*, *magnesia*, and *potassa*. The experiments, however, led to no decided conclusion as to the nature of the active principle. "The peculiar bitterness and nauseating properties of the plant seemed more fully developed in the ethereal extract than in any other form." (*Am. Journ. of Pharm.* vol. vi. p. 20.)

Medical Properties.—Considerable variance of opinion has existed with regard to the influence this medicine is capable of exerting upon the animal economy. By the late Professor B. S. Barton, it is stated to be astringent: he further informs us that "in a putrid sore throat, which prevailed many years ago in Jersey, a strong decoction of the roots was used with great benefit as a gargle." Dr. Mears, who tried the medicine upon himself, reports a decided impression upon the brain, evinced by a distressing pain in the head, and giddiness; it also increased the force and fulness of the pulse, and produced a flushed condition of the face: uneasiness of the stomach, and violent efforts to vomit were also among the symptoms experienced by him. (*Phil. Monthly Journ. of Med. and Surg.* Sept. 1827.) Dr. Garden had previously mentioned the tendency to affect the brain, which is compared to digitalis; this writer also states that it operates powerfully upon the secreting organs and absorbents, and that when exhibited in large doses, nausea, vertigo, anxiety, great restlessness, pains in the extremities, &c., were occasioned. (Togno and Durand in *Translation of Manual of Edwards and Vavasseur*, p. 339.) Dr. Chapman, speaking of this article, informs us that he has never been able to discover the astringent action in any great degree, but that it is "expectorant, narcotic, antispasmodic, diaphoretic, and in large doses emetic. Given so as to affect sensibly the system, we find, first, some nausea, followed by greater freedom of expectoration, and more or less relaxation of surface, with slight nervous tremors and vertiginous affection. The pulse during this state is considerably lowered, and is apt to remain so for some time." (*General Therapeutics.*) In addition to these views with regard to the medicine, it may be further stated that, it has been regarded as

having a control over the uterus. The diseases to which it has been applied are as diversified as the effects just referred to. Dr. Garden thought highly of it in phthisis pulmonalis, but that the diagnosis was strictly accurate cannot be assumed; the probability is that it proved beneficial rather in similative cases. It is not difficult to understand how service can be obtained in humoral asthma, catarrh, and analogous affections, in which it has been recommended, by a stimulating impression upon the mucous membrane, and the promotion of healthy expectoration. The evidence of a favourable action in rheumatism is of a decided character. In the wards of Professor Dunglison, at the Philadelphia Hospital, it has been used with benefit. He informs us that "when pushed so as to produce catharsis and even slight narcosis it certainly appeared to be of service in the acute forms." (*General Therapeutics and Mat. Med.* vol. ii. p. 194.) In the chronic form we should expect much more to be accomplished by it.

In chorea it is highly spoken of. Several years ago Dr. Young (*American Journ. of Med. Science*, vol. ix.) brought cimicifuga before the profession as a remedy in this disease, and his results have to a certain extent been verified by other physicians. Professor Wood found that a case under his care yielded to it, after the failure of purgatives and metallic tonics. The latter author also exhibited it satisfactorily in a case of convulsions occurring periodically, and connected with uterine disorder. In these cases, however, its precise mode of operation is obscure.

Black snakeroot may be given in powder, in doses of half a drachm two or three times daily.

The decoction is made by boiling for a few minutes ℥j. of the contused root in Oj. of water. The dose is ℥i. or ℥ij. two or three times daily. This is a better form than the powder.

The tincture may be made with ℥iv. of the bruised root, and Oj. of Diluted Alcohol. The dose is gtt. xx. to f℥j. two or three times daily. This preparation is adapted to rheumatic cases.—J. C.]

(5. COPTIS TRIFOLIATA, *Salsb.*—GOLDEN THREAD.)

Sex. Syst. Polyandria, Polygynia.

(Coptis, U. S. The Root.)

[BOTANY. **Gen. Char.**—*Sepals* five to six, petaloid, deciduous. *Petals* five to six. *Stamens* fifteen to twenty-five. *Follicles* five to ten on long stipes, somewhat stellately diverging, membranaceous, ovate oblong, pointed with the style, four to eight seeded. *Herbs* with radical, divided, subcoriaceous leaves, and very slender, extensively creeping roots.

Sp. Char.—*Leaves* three foliate; *leaflets* cuneiform-obovate, crenately and mucronately toothed, obscurely three-lobed; *scape* one-flowered. *Roots* consisting of long bright yellow fibres, intensely bitter. *Leaves* evergreen; *leaflets* about an inch long. *Scape* slender, three to five inches high. *Sepals* five to seven, oblong obtuse, white. *Petals* much shorter than the sepals, yellow at base. *Carpels* acuminated with the persistent style. *Seeds* oblong, black and shining; *raphe* very indistinct. (Torrey and Gray, *Flor. of North Amer.* i. 28.)

Hab.—This plant is found in mountain bogs, from Greenland and Labrador to Pennsylvania.

The root, which is the officinal portion, is brought into the market in the dried state. It is filamentous, threadlike, and of a deep golden yellow colour, very brittle. The fibres are usually commingled with the leaves of the plant. By the Shakers, the whole plant appears to be compressed into the square form. It has no odour; the taste is bitter without astringency.

This article of the Materia Medica is ranked among the pure bitters, as its medicinal properties appear solely to depend upon a bitter extractive matter. It may be employed as a tonic under circumstances calling for the exhibition of

such remedies, and may be ranked with *sabattia* and that class of articles, acting as a stomachic, improving the appetite, &c. It is not as powerful as gentian, quassia, and other pure bitters. In the treatment of apthous sore mouths of children it has been used as an application in New England.

The mode of employment may be in the form of *infusion*, which may be made in the proportion of ʒss. to Oj. of Water.—Dose, ʒi. to ʒij.

A *tincture* is made by macerating ʒi. of the Root in Oj. of Alcohol.—Dose, fʒi. to fʒij.

The dose of the powder is gr. xx. to ʒi. An extract might be prepared.—J. C.]

OTHER MEDICINAL OR POISONOUS RANUNCULACEÆ.

1. The leaves of HELLEBORUS FŒTIDUS are emetic and purgative. They have been employed as a vermifuge against the large round worm (*Ascaris lumbricoides*).

2. HELLEBORUS VIRIDIS possesses similar properties.

3. ACONITUM FEROX is, perhaps, the most violent of the ranunculaceous poisons. It is a Nepal plant, and constitutes the *Bish* or *Bikh* poison of that country. Several years since I undertook, at the request of Dr. Wallich, to examine the effects of this plant on animals. My experiments were made with plants which had been ten years in Dr. Wallich's possession, and which, therefore, had doubtless lost part of their activity; yet their effects were most energetic, (Wallich's *Plantæ Asiaticæ rariores;* and the *Edinb. Journ. of Nat. and Geogr. Science*, July 1830, p. 235); but of the same nature as those of Aconitum Napellus.

[The DELPHINIUM CONSOLIDA is officinal in U. S. Pharmacopœia.]

[ORDER LXXXV.—PODOPHYLLEÆ.—*Lind.*]

ESSENTIAL CHARACTER.—*Sepals* three to four, deciduous or persistent. *Petals* in two, three, or more rows, each of which is equal in number to the sepals. *Stamens* hypogynous, twelve to eighteen, arranged in two, three, or more rows; *anthers* linear, oval, turned inwards. *Stigma* somewhat peltate. *Fruit* succulent or capsular, one-celled. *Seeds* indefinite; *embryo* small.

Herbs.—Leaves broad-lobed. *Flowers* radical, solitary, white. (Beck).

(1. PODOPHYLLUM PELTATUM, *Linn.*—MAY APPLE.)

Sex. Syst. Polyandria, Monogynia.

(Podophyllum, U. S. The Root.)

[BOTANY. **Gen. Char.**—*Sepals* three. *Petals* six to nine. *Stamens* twelve to eighteen. *Stigma* large, subsessile, peltate. *Berry* somewhat fleshy, not dehiscent. *Seeds* many.

Sp. Char.—*Stem* erect, two-leaved, one-flowered; *fruit* ovate.

The common names by which this plant is known are *May Apple* and *Hog Apple*. It has a large horizontal creeping perennial root; the stem is from eight to twelve inches high, naked, with sheathing stipules at the base, dichotomous at the summit, dividing into two petioles two to four inches in length, each bearing a peltate leaf. The leaf is large, hanging, divided into five to seven lobes, cuneate, oblong, dentate, and often bifid at the apex. Flower solitary in the axil of the petioles; peduncle recurved, white. The fruit is an oval berry, an inch and a half long, smooth, yellowish when mature, succulent and pulpy, having a mawkish sweet taste, edible but not agreeable.

Hab.—May Apple is common throughout the United States in moist woods, and shady situations along the banks of rivulets. It flowers in May.

In the dried state the root is found in pieces several inches in length, the thickness of quills; some of them are knotty and swollen at intervals (jointed), and beset with the remains of the radicles, somewhat corrugated and wrinkled; externally the colour is deep brown or blackish; internally dingy white. The fracture is short. The entire root has little odour; the taste is sweetish, bitter, and somewhat acrid.

The powder is grayish; it has somewhat the odour of ipecacuanha.

Chemical Composition.—Podophyllum has been examined with the view to determine its constituents. Dr. E. Staples found it to contain, resin, starch, and a peculiar vegetable substance crystallizable in white silky tufts. (Togno and Durand, *Transl. of Edwards and Vavasseur's Manual.*) Mr. Hodgson obtained from it also a peculiar principle. To this the name *Podophylline* has been given.

Podophylline.—(Hodgson.) When dry this substance is in pale brown scales of considerable lustre; is easily pulverized, is unalterable in the air, and has a strong bitter taste. It is copiously soluble in strong alcohol, and much more so in boiling than in cold water, the aqueous solution retaining when cold, about a grain to the ounce. It is soluble to some extent in sulphuric ether. It is readily separated from water by muriatic acid, is coloured red by nitric acid, and becomes first olive or green, and subsequently purple by sulphuric acid. Exposed to heat it fuses, blackens, and dissipates in black smoke. (*Journ. of Phil. Col. of Pharm.* iii. 275.) It has not as yet been determined whether this or the resin is the active principle.

Medical Properties.—May Apple root is an active cathartic, resembling jalap in its action upon the bowels. It stimulates the muciferous glands and exhalents, and occasions watery discharges; in too large quantities, giving rise to tormina. It is highly spoken of by many eminent writers, who have tested its efficacy. Dr. Eberle (*Mat. Med.*) says he very frequently gave it instead of jalap, and always found it active and safe in its operation. Dr. Burgon regarded it as slower in its operation than the article mentioned, but as leaving the bowels longer in a lax and soluble condition. (*Med. Recorder*, iii. 332.) The cases to which it is adapted are of an inflammatory character, especially at the commencement, where brisk purging is required. In bilious fever and intermittents, it has been much used throughout the country. Combination with calomel, or cremor tartar increases its certainty, and at the same time moderates its drastic action. In over doses, it occasions tormina and tenesmus, and hypercathasis with muco-bloody discharges; it also nauseates the stomach and induces emesis.

The leaves of the plant and young shoots are said to be highly poisonous.

The dose of the powdered root is from ten to twenty grains.

EXTRACTUM PODOPHYLLI, U. S. This preparation is made in the same way as the Extract of Jalap, p. 336. It has the advantage over the crude medicine of being given in smaller bulk, and may be substituted for it, or for the Extract of Jalap.—Dose ten to fifteen grs.—J. C.]

[Order LXXXVI.—JUGLANDEÆ.—*De Cand. Lind.*]

Essential Character.—*Flowers* diclinous. *Sterile flowers* in an ament. *Perianth* scaly, oblique, irregularly lobed. *Stamens* inserted on the receptacle, indefinite, (three to thirty-six); *filaments* short, distinct; *anthers* thick, two-celled, bursting longitudinally. *Fertile flowers* with a single or double perianth, the outer four-parted, the inner (when present) of four pieces. *Ovary* inferior, one-celled; *ovule* solitary, erect; *styles* one to two, very short or none; *stigmas* large, either two and lacerated or discoid and four-lobed. *Fruit* drupaceous, one-celled, with four imperfect partitions. *Seed* four-lobed; *embryo* large; *albumen* none; *cotyledons* fleshy, two-lobed, wrinkled; *radicle* superior.

Trees.—*Leaves* alternate, unequally pinnate (Beck.)

(JUGLANS CINEREA, *Linn.*—BUTTERNUT.)

Sex. Syst. Monœcia Polyandria.

(Juglans, U. S. The inner Bark of the Root.)

[Botany. **Gen. Char.**—Monœcious, *Sterile flowers*. Ament imbricate, scales mostly five-parted. *Perianth* five to six parted. *Stamens* eighteen to thirty-six. *Fertile flowers*. *Perianth* double, each four parted. *Styles* one or two. *Drupe* partly spongy; *nut* rugose and irregularly furrowed.

Sp. Char.—*Leaves* pinnate; *leaflets* numerous, lanceolate; serrate rounded at the base, soft pubescent beneath; *petioles* villous; *fruit* oblong ovate, with a terminal projection, viscid and hairy, on a long peduncle; nut oblong, acuminate, conspicuously sculptured, *Beck.* (*Botany of North. and Mid. States*, 335.)

This plant is the *J. cathartica* of *Michaux*. The common names by which it is known are, *White Walnut* and *Butternut*. In some situations it is a large tree, with numerous branches and a smooth cinereous bark. The fruit is less rank and strong than the black walnut, but by age becomes rancid and unpleasant, it abounds in oil. Early in the spring, if the bark be pierced, there exudes a saccharine juice.

Hab.—Butternut abounds in Canada and the northern and middle sections of the United States, in rich bottom lands and along streams. It flowers in May and the fruit ripens in September and October.

The inner bark, when first separated from the tree, is of a pure white colour, but soon begins to change, and by the time it becomes dry, is of a deep brown colour. It comes into the market in pieces, which have a fibrous fracture. If the epidermis has not been removed, they are smooth externally. The inner bark is the officinal portion; that from the root is most active. When in the fresh state a rubefacient effect is stated to be made upon the skin. The period for collecting it is in May. The odour is feeble, and the taste is bitter and pungent.

Composition.—Mr. S. Wetherill found in this bark *fixed oil*, *resin*, *saccharine matter*, *lime* and *potassa*, *a peculiar principle* (*extractive?*), and *tannin*. (*Unpublished Essay.*) Dr. Bigelow did not find tannin by the action of gelatine. Mr. Wetherill, however, found a precipitate afforded by standing.

EXTRACTUM JUGLANDIS, U. S. *Extract of Butternut.*—This is the officinal preparation, which is mostly used. It is made by displacement from the bark, in coarse powder, by means of water and evaporating the solution. It is of a black colour, having a caromel-like odour, and bitter astringent taste. It is a pretty certain mild cathartic, operating without pain or irritation, and evacuating the alimentary canal without depletion. For a long time it has been employed as a purgative throughout the country, and is one of the articles to which Dr. Rush directed attention. Dr. Barton in his "*Collections*" also speaks highly of it. By all the subsequent writers upon Materia Medica it is noticed as one of the most valuable of our indigenous productions. The cases to which it is adapted are, fevers, with disturbance of the liver and congestion of the abdominal organs, habitual costiveness and dysenteric affection. By combination with a mercurial, as blue pill or calomel, its powers are increased. The dose is 10 to 30 grains, in pill. The extract which is brought in from the country, and made by decoction is objectionable, from the little care taken in its preparation.

A decoction is sometimes used, but the taste and the quantity required render it inferior to the officinal preparation.—J. C.]

[Order LXXXVII.—GERANIACEÆ, *De Cand. Linn.*]

Essential Character.—*Sepals* five, persistent, more or less unequal, with an imbricate aestivation; sometimes saccate or spurred at the base. *Petals* five, (or by abortion four, rarely none,) unguiculate. *Stamens* usually monadelphous, hypogynous, twice or thrice as many as the petals. *Ovary* composed of five pieces, placed round an elevated axis, each one celled, one seeded; *ovules* pendulous; *styles* five, cohering round the axis. *Fruit* formed of five carpels cohering round the axis, having a membranous pericarp and terminated by an indurated style, which finally twists and carries the pericarp along with it. *Seeds* solitary pendulous; *albumen* none. *Embryo* curved; *radicle* pointing to the base of the cell; *cotyledons* foliaceous, convolate and plaited.

Herbs or shrubs.—*Stems* tumid and separate at the joints. *Leaves* either opposite or alternate. (Beck.)

(GERANIUM MACULATUM, *Linn.*—SPOTTED GERANIUM.)

Sex. Syst. Monadelphia, Decandria.

(Geranium, U. S.—The Root.)

[Botany. **Gen. Char.**—*Sepals* five, unequal. *Petals* five, equal. *Stamens* alternate, fertile ones larger, and with nectariferous scales at the base. *Carpels*

with long awns, at length separating elastically from the summit to the base; awns smooth internally. (Beck.)

Sp. Char.—*Root* perennial, irregularly gibbous and horizontal, brownish, mottled with green externally, and greenish white internally. From the root spring a number of radical leaves and one or more stems, these are erect and terete, of a green colour and furnished with reflexed hairs. At the height of six, eight, or ten inches from the ground, the stem becomes forked; and at the point of division is furnished with two large petiolate leaves which are generally reflexed. *Leaves* on the upper part of the stem either with very short petioles or sessile. The peduncles arise from the dichotomous divisions of the stem, and support two flowers on short pedicels. The calyx consists of five oval, lanceolate, ribbed, cuspidate segments, plumosely ciliate at their outer margin, and membranous on the other; sometimes three of the segments only are ciliate. *Petals* five, obovate, not emarginate. *Stamens* ten, furnished at the base with glands, and terminated by oblong convex deciduous anthers of a purple colour. Germ ovate. *Style* persistent, the length of the stamens at first, but afterwards elongated. *Stigmas* five. *Capsule* containing five seeds, which when mature, become detached by the elasticity of the awns. (Griffith, *Am. Journ. of Pharm.* vol. iv. p. 90.)

The common names for this plant are *Crowfoot* and *Crane's bill*. It is a handsome plant of which there are several varieties, varying in the form of the foliage and colour of the flower, these depend upon soil and situation. The most usual colour of the flower is lilac.

Hab.—The geranium maculatum is common throughout the United States, growing in hedges and borders of damp woods. It flowers in May.

In the dried state the root presents itself in pieces an inch or two in length, and three to four lines thick, corrugated, wrinkled and rough, with a few fibres attached, externally the colour is brown, internally dingy white. It breaks with a short fracture. The odour is feeble, the taste astringent and bitter. The powder is gray.

Chemical Composition.—From Dr. Staples' analysis, it appears that Geranium contains *gallic acid* in large quantity, *tannin*, *mucilage* in small proportion, *amadin*, *red colouring matter*, principally in the external covering of the root, *resin* in small quantity, and a crystallizable vegetable substance. (*Journ. of Phil. Col. Pharm.* i. 171.)

Medical Properties.—Geranium is an astringent of some power, and the therapeutical uses to which it has been put are based upon this action. It early attracted the attention of those who were inquiring into the remedial value of indigenous plants, and has been uniformly spoken of by all subsequent writers upon the same subject. In its effects and range of application it differs not from others of the same class, more powerful than some and less so than others. In hemorrhages, and bowel affections, under the appropriate pathological conditions calling for their exhibition, geranium may be administered with advantage. As a local application in chronic inflammation, ulceration, &c., benefit may equally be expected from it, as for instance in the form of a gargle where the throat is involved, and in that of injection in gonorrhœa and leucorrhœa. The forms of exhibition are varied.

If the powder be used the dose is from 10 to 30 grains. The *decoction* is made by boiling an ounce of the bruised root for a few minutes in a pint of water. Dose f℥j. to f℥ij. An *infusion* may be prepared in the same manner. A *tincture* and an *extract* may be prepared from it.—J. C.]

[ORDER LXXXVIII.—CORNACEÆ, *De Cand.*—THE DOGWOOD TRIBE.]

[ESSENTIAL CHARACTER.—*Calyx* adherent to the ovary; *limb* four to five-toothed, minute or four to five-lobed, with a valvate æstivation. *Petals* distinct, equal in number to the teeth of the calyx, and inserted alternately with them into the margin of the hypogynous disk, broad at the base; *æstivation* valvate. *Stamens* four to five, inserted with the petals and alternate with them; *anthers* introrse, mostly cordate. *Ovary* one-celled, with solitary pendulous ovule in each cell; *styles* single. *Drupes* baccate with a one to two-celled nucleus, crowned with the remains of the calyx. *Seeds* anatropous. *Embryo* nearly the length of the fleshy albumen; the radicle shorter than the oblong cotyledons.

Trees or *shrubs*, rarely herbaceous, with a bitter bark. *Leaves* opposite (or rarely somewhat alternate), mostly entire, exstipulate, pinnately veined. *Flowers* cymose; the inflorescence sometimes capitate and involucrate, rarely diœcious. *Hairs* centrally affixed. (Torrey and Gray.)

(CORNUS FLORIDA, *Linn.*—DOGWOOD.)

Sex. Syst. Petandria, Monogynia.

(Cornus Florida, U. S.—The Bark.)

[BOTANY. **Gen. Char.**—Limb of the *calyx* four-toothed, minute. *Petals* oblong, spreading. *Filaments* filiform. *Style* subclavate; *stigma* obtuse or capitate. *Drupes* not connate into a syncarpium. *Leaves* entire, minutely scabrous with the appressed bicuspidate hairs. *Flowers* white, rarely yellow. (T. and G.)

Sp. Char.—*Leaves* of the involucre four, obcordate, or with a callous notch at the apex, drupes oval; *leaves* ovate acuminate.

FIG. 253.

Cornus Florida.

Dogwood is a small tree varying in height from 15 to 20 or 30 feet, rarely attaining more, with an irregular growth. The branches are numerous and expanded. It is a conspicuous ornament of the forest in the spring of the year, when the large leafy involucres are expanded and resemble showy white flowers diffused in every direction. Within the involucres are the flowers, in clusters, rather inconspicuous, greenish yellow. The leaves are developed after the flowers. In the fall of the year they become deep red. The drupe or berry is bright red when mature.

Hab.—This plant is common throughout the United States, growing in open woods in moist soil from Canada to Florida and Louisiana. Its growth is modified by the climate; to the south it attains its extreme size. In the northern sections of the country the time of flowering is May, but in the Southern it is during March and April.

The bark of the tree constitutes the officinal portion, that from the root is regarded as most efficacious. It is brought into the market in pieces slightly quilled, several inches long, half an inch to two broad, and two or three lines thick, of a grayish red colour, breaking with a short fracture and exposing lighter-coloured surfaces, mottled with red and white. The pieces from the root are rougher externally and more frequently destitute of epidermis. The odour is feeble; the taste bitter and astringent, with a little aroma. In the fresh state the taste is a little acrid.

CHEMICAL COMPOSITION.—Dr. Walker who analysed the bark announced that it contained, *gum*, *resin*, *tannin*, and *gallic acid*. To these have since been added by Mr. Cockburn, (*Am. Journ. of Pharmacy*, vol. vii. p. 114,) *oil*, *fatty matter*, a *crystalline substance*, *bitter extractive*, *wax*, *red colouring matter*, *lignin* and *potassa*, *iron*, *lime*, and *magnesia*. From his experiments it appeared that the bitterness alone resided in the extractive matter, from which the crystalline substance was obtained.

A principle, to which the name *cornine* was given, was several years since announced, but has not been subsequently obtained by analysts.

Medical Properties.—The article under consideration is a decided roborant, and hence has been placed by systematic writers in the list of tonics. By Dr. Walker it was found to augment the force and frequency of the pulse and to increase the heat of the body. It also has an astringent effect. An analogy has been supposed to exist between its mode of operation and that of cinchona, but it does not seem to be possessed of more than a general invigorating effect. As a substitute for bark or its preparations, dogwood has been employed in the treatment of intermittent fever, and in domestic practice is much used. Advantage has also been derived from it in the hands of regular practitioners. The objection to its use, however, is the large doses required, which disorder the stomach. As a mere tonic it is applicable to the same range of cases as other of its congeners. The recent bark is apt to disagree with the stomach and produce pain.

Dogwood bark may be given in powder, infusion, decoction, or extract. The dose in substance is ℈j. to ʒj.

DECOCTUM CORNUS FLORIDÆ, U. S. *Decoction of Dogwood Bark.* Take of Dogwood, bruised, an ounce; Water, a pint. Boil for ten minutes in a covered vessel, and strain the liquor while hot. Dose fʒj. to ʒiij.

Two other species of Cornus, the C. circinata and C. sericea have been placed in the secondary list of the United States Pharmacopœia. Both of these are shrubs. The bark is in the quilled form. The medical properties are nearly similar to those of the *C. florida.* They are employed in the same way and for the same purposes.—J. C.]