THE

ELEMENTS

OF

MATERIA MEDICA.

II. ORGANISED KINGDOM.

I. The Vegetable Sub-Kingdom.

Division I. Cryptogamia, *Linnæus*.—Flowerless Plants.

Acotyledones, *Jussieu*.—Cellulares, *De Candolle*.—Acrogens, *Lindley*.

Essential Character.—*Substance of the plant* usually composed of cellular tissue chiefly, either in a spheroidal or elongated state; spiral vessels or ducts only present in the highest orders. *Stem* either increasing by an extension of its point, or by a regular or irregular development in all directions from one common point; not increasing perceptibly in thickness or density when once formed. *Cuticle* generally destitute of stomata. *Sexual organs*, and consequently *flowers*, absent. Reproduction taking place either by *spores* or *sporules* [*sporæ* seu *sporulæ*], which are inclosed in cases called *thecæ* [*sporangia*], or imbedded in the substance of the plants; or else by a mere dissolution of the utricles of cellular tissue; *germination* occurring at no fixed point, but upon any part of the surface of the spores (*Lindley*).

Fig. 105.

Structure of Cryptogamic Plants.

a. Longitudinal section of a stem.
b. Transverse section of a stem.
c. Stem of a moss with leaves and theca, or seed-case.
d. Leaf of a moss magnified.
e. Leafy thallus of a lichen with apothecia.
f. Crustaceous thallus of a lichen with apothecia.
g. Fungi of the highest tribe.
h, *i*. Fungi of the lowest rank.
k. Conferva magnified.

Order I.—ALGÆ, *Juss*.—THE SEA-WEED TRIBE.

Algaceæ, *Lindley*.

Essential Character.—Leafless, flowerless plants, with no distinct axis of vegetation, growing [with very few exceptions] in water, frequently having an animal motion, and consisting of simple vesicles lying in mucus, or of articulated filaments, or of lobed fronds, formed

of uniform cellular tissue. *Reproductive matter* either altogether wanting, or contained in joints of the filaments, or deposited in *thecæ* of various forms, size, and position, caused by dilatations of the substance of the frond. *Sporules* with no proper integument, in germination elongating in two opposite directions (*Lindley*).

Properties.—None of the plants of this order are poisonous. A mucilaginous[1] or gelatiniform matter (*carrageenin*, *pectin*) and sugar (*mannite*) render several species nutritious, emollient, and demulcent. Some Algæ have been found beneficial in scrofulous affections and glandular enlargements. The good effects are referrible to *iodine*, (see vol. i. pp. 222, 223), and in part, perhaps, to *alkaline salts*. A vermifuge property has been ascribed to some species.

Laennec (*Treat. on Diseases of the Chest*, by Dr. Forbes, p. 369) tried the influence of an artificial "marine atmosphere" (air impregnated with the vapour of fresh sea-weed) on consumptive patients, and was impressed with an idea of its efficacy; but experience shows that the inhabitants of sea-coasts are as liable to phthisis as those of inland districts.

1. FU'CUS VESICULO'SUS, *Linn. D.*—SEA WRACK.

Sex. Syst. Cryptogamia, Algæ.

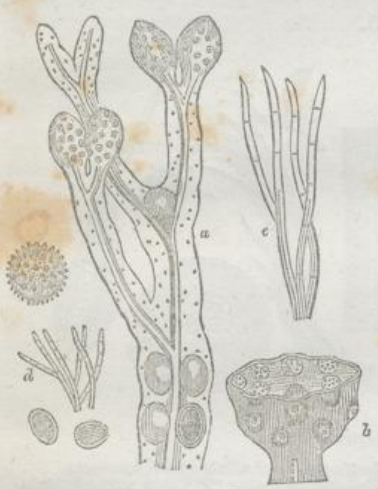
(Herba cum fructu. *Ph. Dub.*)

History.—Theophrastus (*Hist. Plant.* lib. iv. cap. vii.) mentions several species of Algæ (φῦκος), but he includes under this name Rocella tinctoria. Fucus vesiculosus is sometimes termed *Quercus marina*, *Bladder Fucus*, and *Common Sea-ware*.

Botany. **Gen. Char.**—*Frond* plane, compressed or cylindrical, linear, dichotomous, coriaceous. *Air-vessels* [*vesiculæ*] when present innate in the frond, simple, large. *Receptacles* terminal (except in *F. nodosus*), turgid, containing tubercles, imbedded in mucus, and discharging their *seeds* [*sporangia*] by conspicuous pores (*Greville*).

Sp. Char.—*Frond* plane, linear, dichotomous, entire at the margin. *Air-vessels* roundish-oval in pairs. *Receptacles* mostly elliptical, terminating the branches (*Greville*).

Fig. 106.



Fucus vesiculosus.

a. Upper part of a frond.
b. Section of a receptacle.
c. Tubercle.
d. Filaments and sporangia, of which the tubercles are composed.
e. Filaments which issue from the pores on the surface of the frond.

Hab.—Sea-shores. Very common everywhere.

Physical Properties.—Its substance is thickish, flexible, but very tough. Its colour is dark, olivaceous, glossy green, paler at the extremities, becomes black by drying. Its odour is strong; its taste nauseous.

Composition and Characteristics.—It has been analyzed by Stackhouse, (*Dict. Scien. Nat.* xvii. 500), by Gualtier de Claubry, (*Ann. Chim.* xciii. 116), by John, (*Schweigger's Journ.* xiii. 464,) and by Fagerstrom, (Gmelin, *Handb. d. Chem.* Bd. ii. S. 1354).

It is composed of *Cellular Tissue*, *Mucilaginous Matter* (pectin?) *Odorous Oil*, *Colouring* and *Bitter Matters*, and *Salts of Calcium* and *Sodium* (iodide, sulphates, and chloride).

By treating the distilled water of Fucus vesiculosus with ether, *a semi-solid white oil* is extracted, which is the odorous principle. The aqueous decoction of this plant is neutral, and contains chloride of sodium, sulphates of soda and lime,

[1] *On the Mucilage of the Fuci, with Remarks on its Application to economical ends*, by Mr. S. Brown, Jr. in Jameson's *Edinb. New Phil. Journ.* vol. xxvi. p. 409, 1839.

and a mucilaginous substance somewhat analogous to *pectin*. It yields, with chlorine and starch, faint traces only of iodine. But if alcohol be added, by which the mucilage and a part of the sulphates are thrown down, the alcoholic liquor evaporated, and the residue mixed with potash, then calcined, and afterwards treated with hydrochloric acid to disengage hydrosulphuric acid, we may detect iodine in the filtered liquor by the deep blue colour formed on the addition of starch and chlorine. (Guibourt, *Hist. des Drog.* 3d ed. ii. 395.) By combustion in the open air, this plant yields an ash, called *Kelp* (vide Kelp); and by incineration in a covered crucible it gives a charcoal, termed *Vegetable Ethiops*.

Physiological Effects.—During the winter, in some of the Scottish islands, horses, cattle, and sheep, are fed on it. (Greville, *Algæ Brit.* xx.) Its local action is detergent, and perhaps discutient. Its remote effects are probably analogous to those caused by small doses of iodine, modified by the influence of salts of sodium and calcium.

Uses.—Frictions of the plant, with its contained mucus, were employed, with supposed advantage, by Dr. Russell, (*Dissertation on the Use of Sea-Water*, 5th ed. 1769, pp. 41 and 44,) in glandular enlargements and other scrofulous tumors: the parts were afterwards washed with sea-water. He also gave internally the expressed juice of the vesicles in glandular affections. (*Op. cit.* p. 99.)

Æthiops Vegetabilis; *Vegetable Ethiops*.—This is prepared by incinerating Fucus vesiculosus in a covered crucible. It is composed of *Charcoal*, *Chloride of Sodium*, *Carbonate of Soda*, *Sulphurets of Sodium and Calcium*, and traces of an *Alkaline Iodide*. It has been exhibited in bronchocele and scrofulous maladies. Dr. Russell (*Op. cit.* p. 98,) says, it far exceeds burnt sponge in virtue. It has been employed also as a dentifrice. The dose of it is from ten grains to two drachms.

2. CHON'DRUS CRIS'PUS, *Grev.*—CARRAGEEN OR IRISH MOSS.

(Chon'drus, U. S.)

Sex. Syst. Cryptogamia, Algæ.

(Planta, *Offic.*)

History.—It was introduced into medicine by Mr. Todhunter, of Dublin. (Reece's *Monthly Gazette of Health*, Jan. 1831.) It is sometimes sold as *Pearl Moss*.

Botany. **Gen. Char.**—*Frond* cartilaginous, dilating upwards into a flat, nerveless, dichotomously divided frond, of a purplish or livid red colour. *Fructification:* subspherical *capsules* [*sporangia?*] in the substance of the frond (rarely supported on little stalks), and containing a mass of free *seeds* [*sporules?*] (*Greville*).

Sp. Char.—*Frond* plane, dichotomous, the segments linear, wedge-shaped. *Capsules* subhemispherical, imbedded in the disk of the frond (*Greville*).

Hab.—On rocks and stones on the sea coast: very common. For dietetical and medicinal uses it is collected on the coasts of Ireland (especially in Clare), washed, bleached (by exposure to the sun), and dried.

Physical Properties.—In the recent state it is purple-brown or purple-red, becoming greenish and ultimately whitish in decay. As met with in commerce,[1] it is dry, crisp, mostly yellowish or dirty white, but intermixed with purplish red portions, inodorous or nearly so, with a mucilaginous taste. It swells up in water. A calcareous meshy crust (consisting of various species of *Flustra*) is frequently found on the frond.

Composition.—It has been analyzed by Herberger, (Dierbach, *Die neuesten*

[1] An anonymous reviewer (*Edin. Med. and Surg. Journ.* vol. lv. p. 220) states that *Chondrus mammillosus* in tolerably large quantity, is occasionally found in the carrageen of commerce.

Entd. in d. Mat. Med. 1837,) and by Feuchtwanger. (*American Journal of Science and Arts*, xxvi.)

Herberger.		*Feuchtwanger.*
Vegetable jelly	79·1	Jelly { Pectin (a large portion). Starch.
Mucus	9·5	
Two resins	0·7	Oxalate of lime.
Fatty matter and free acids	*traces*	Compounds of sulphur, chlorine, and bromine.
Chlorides of sodium and calcium, potash, lime, &c.	*traces*	No fungic, boletic, or lichenic acids.
No traces of iodine or bromine could be recognized.[1]		

Carrageenin.—The mucilaginous matter (called by some writers *Vegetable Jelly*, by others *Pectin*,) appears to me to be a peculiar substance, which I shall term *Carrageenin*. It is soluble in boiling water, and its solution forms a precipitate with diacetate of lead and silicate of potash, and, if sufficiently concentrated, gelatinizes on cooling. Carrageenin is distinguished from ordinary gum by its aqueous solution not producing a precipitate on the addition of alcohol; from starch, by its not assuming a blue colour with tincture of iodine; from animal jelly, by tincture of nutgalls causing no precipitate; from pectin, by acetate of lead not throwing down any thing; as well as by no mucic acid being formed by the action of nitric acid. Dr. Lucae (*Berlin. Jahrb.* xxxiv. Abth. i.) regards carrageenin as more closely resembling animal jelly than any other substance.

Chemical Characteristics.—The presence of carageenin in the decoction is demonstrated by the tests just enumerated. No iodine is recognizable by nitric acid and starch. Oxalate of ammonia detects lime (or calcium) in solution, while nitrate of silver points out the presence of chlorine. Guibourt (*Journ. de Chim. Med.* viii. 663,) could recognize neither sugar nor magnesia.

Physiological Effects.—Chondrus crispus is nutritive, very digestible, emollient, and demulcent.

Uses.—It is a popular remedy for pulmonary complaints (especially of a phthisical character, chronic diarrhœa and dysentery, scrofula, rickets, enlarged mesenteric glands, irritation of bladder and kidneys, &c. As a culinary article it is employed as a substitute for animal jelly, in the preparation of *blanc-mange*, jellies, white soup, &c.

Administration.—It is usually exhibited in the form of decoction or jelly.

1. DECOCTUM CHONDRI.—Macerate half an ounce of carrageen in cold or warm water, during ten minutes; then boil in three pints of water, for a quarter of an hour. Strain through linen. Milk may be substituted for water when the decoction is required to be very nutritious. By doubling the quantity of carrageen a *mucilage* is procured. Sugar, lemon juice, tincture of orange-peel, or aromatics, as cinnamon or nutmeg, may be employed as flavouring ingredients.

2. GELATINA CHONDRI.—Prepared by concentrating the decoction, or by employing a larger quantity of carrageen.

3. GIGARTINA HELMINTHOCORTON, *Grev.*—CORSICAN MOSS.

Sex. Syst. Cryptogamia, Algæ.

(Planta, Offic.)

History.—This plant has been in use for several centuries among the natives of Corsica, as a remedy for intestinal worms. In 1756, Vaucher sent it to Paris.[2]

Botany. **Gen. Char.**—*Frond* horny or cartilaginous, filiform, cylindrical, irregularly branched. *Fructification* uniform; spherical, sessile *capsules* containing a globose mass of *seeds* [*sporules?*] (*Greville.*

Sp. Char.—*Frond* cartilaginous, terete, tufted, entangled. *Stem* filiform creeping: branches setaceous, somewhat dichotomous marked indistinctly with transverse streaks.

Hab.—The Mediterranean Sea, on the shores of Corsica.

Physical Properties.—Under the name of Corsican moss is sold in the

[1] More recently both brome and iodine have been detected in this plant (*Pharmaceutisches Central Blatt*, für 1839, S. 159).

[2] J. P. Schwendimann, in Schlegel's *Thesaurus Mat. Med.* t. iii. p. 181.

shops a mixture of various marine vegetables and animals. The essential, though usually smaller, part of the mixture is the Gigartina Helminthocorton; the remainder consists of Corallines. Sertularias, and Ceramiums, to the number of twenty species. (De Candolle, *Essai sur les Proprietes Med.* p. 348, 2d ed.) Lamaroux states he found the remains of eighty species of marine plants. (Fée, *Cours d'Hist. Nat.* i. 147.) See also T. C. Martius. (*Grundriss d. Pharmakog.* 12.)

The structure of the frond of Gigartina Helminthocorton is "very peculiar, being exceedingly lax and cellular, with a consistence similar to that of the stems and leaf-stalks of some aquatic herbaceous phænogamous plants, and having the appearance of articulations which do not actually exist." (Greville, *Algæ Brit.* p. 146.) The fructification is scarcely ever seen. The plant has a reddish gray colour externally, but is whitish internally. Its odour is strong, marine, and disagreeable: its taste is saline.

Composition.—Bouvier (*Ann. de Chim.* ix. 83, 1791,) obtained from 100 parts of Corsican moss, *Vegetable Jelly*, 60·2; *Vegetable Fibre*, 11·0; *Chloride of Sodium*, 9·2; *Sulphate of Lime*, 11·2; *Carbonate of Lime*, 7·5; *Iron*, *Manganese*, *Silica*, and *Phosphate of Lime*, 1·7. Straub (*Gilbert's Ann.* Bd. 66, S. 242,) and Gaultier de Claubry (*Ann. de Chim.* xciii. 134,) have subsequently detected iodine, but the quantity is small.

Chemical Characteristics.—Corsican moss effervesces with acids, owing to the carbonate of lime which it contains. The brown watery infusion is deepened in colour by sesquichloride of iron, and lets fall some brown flocculi. Tincture of galls does not alter it. Nitric acid and starch give no indication of iodine.

Physiological Effects.—Its effects are not very obvious. The vegetable jelly must render it nutritive; the iodine and saline matters alterative. Mr. Farr[1] says, that after using the decoction for six or seven days, it acts as a diuretic and diaphoretic, and occasionally produces nausea and giddiness: after some time the stools become darker, present greenish specks, and are sometimes slimy.

Uses.—It has been principally celebrated as an anthelmintic against the large round worm (*Ascaris lumbricoides.*) Bremser (*Sur les Vers Intestin.* 414,) ascribes its efficacy to chloride of sodium.

In 1822, Mr. Farr brought it forward as a remedy for cancer. He was led to try it from the circumstance of Napoleon Bonaparte having stated to Barry O'Meara that it was used in Corsica for dispersing tumors. Experience does not warrant us in ascribing any benefit to its employment in this disease.

Administration.—In powder it is given in doses of a scruple to two drachms, mixed with honey or sugar; but the more usual mode of exhibiting it is in the form of decoction, prepared by boiling from four to six drachms of Corsican moss in a pint of water; of this the dose is a wine-glassful, three times daily.

OTHER MEDICINAL OR ESCULENT SEA WEEDS.

Several species of the inarticulated Algæ are occasionally employed, in some parts of the British islands, as articles of food, or as condimentary substances. Taken in this way, they might perhaps prove serviceable in scrofulous affections and glandular enlargements. Besides the species above depicted, the following have also been used: *Laminaria digitata* (or *Tangle*, vol. i. p. 222, fig. 47, *d*), *Porphyra laciniata* and *vulgaris* (commonly called *Laver*). *Laurentia pinnatifida* (*Pepperdulse*), &c.[2]

Fucus amylaceus or the *Ceylon Moss*[3] has been, within the last few years, introduced into India and England, by M. Previté. As found in commerce it is white, filiform, and fibrous. It

[1] *A Treatise explanatory of a Method whereby occult Cancers may be cured*, 2d ed. 1825.

[2] For further details, consult Dr. Greville's *Algæ Britannicæ*, xxx.; Loudon's *Encyclopædia of Gardening*, 2d ed. p. 886; and Pleneck's *Bromatologia*, pp. 171-3.

[3] Mr. Crawford (*History of the Indian Archipelago*, vol. iii. p. 46) calls it *Agar-agar*.

has the usual odour of sea weeds. It consists, according to Dr. O'Shaughnessy,[1] of *Vegetable Jelly* 54·5, *True Starch* 15, *Ligneous fibre* 18, *Gum* 4, *Sulphate and Muriate of Soda* 6·5, *Sulphate and Phosphate of Lime* 1, *Wax, Iron and Loss* 1. By boiling in water it yields a liquid which gelatinizes on cooling. The decoction or jelly forms an agreeable, light, nourishing, article of food for invalids and children. It may be used as a substitute for farinaceous substances.[2]

FIG. 107.

Esculent Sea Weeds.

a, Rhodomenia palmata (or Dulse),
b, Rhodomenia ciliata.
c, Laminaria saccharina.
d, Iridæa edulis.
e, Alaria esculenta.
f, Ulva laticsima.

ORDER II.—LICHENES, *Juss.*—THE LICHEN TRIBE.

Lichenaceæ, *Lind.*

ESSENTIAL CHARACTER.—*Perennial plants*, often spreading over the surface of the earth, or rocks, or trees, in dry places, in the form of a lobed and foliaceous, or hard and crustaceous or leprous substance, called a *thallus*, *crust*, or *frond* (*receptaculum commune*). This *thallus* is formed of a cortical and medullary layer, of which the former is simply cellular, the latter both cellular and filamentous. In the crustaceous species the cortical and medullary layers differ chiefly in texture, and in the former being coloured, in the latter colourless; but in the fruticulose or foliaceous species, the medulla is distinctly floccose, in the latter occupying the lower half of the thallus, in the former enclosed all round by the cortical layer. *Reproductive* matter of two kinds: 1, *sporules* (*sporulæ*), lying in membranous tubes (*thecæ*) immersed in *nuclei* of the medullary substance, which burst through the cortical layer, and colour and harden by exposure to the air in the form of little disks (*apothecia*), which have received different names according to their forms; 2, the separated cellules of the medullary layer of the tissue (*Lindley*, with some additions).

PROPERTIES.—The lichens, at least the foliaceous ones, contain a starchy substance (called *feculoid* or *lichenin*), which renders them nutritive, emollient, and demulcent. They also possess a bitter principle (*cetrarin*), from which they derive tonic properties. Several lichens, by maceration in ammoniacal solutions, develope brilliant colours, which render them valuable as dyes.[3]

1. CETRA'RIA ISLAN'DICA, *Ach. L. E. D.*—ICELAND MOSS.

Sex. Syst. Cryptogamia, Algæ.

(Cetraria, *L. E.* (U. S.);—Planta, *D.*)

HISTORY.—The medicinal properties of this plant, (usually termed *Lichen islandicus*) were probably first known to the natives of Iceland. According to

[1] *Transactions of the Royal Medico-Botanical Society* for 1837, p. 181.
[2] For further particulars respecting it, see Drs. Sigismund and Farre's work *On the Ceylon Moss*, 1840.
[3] For further details respecting the useful qualities of Lichens, see the *Mémoires couronnés en l'Année* 1786, *par l'Académie des Sciences, Belles-Lettres et Arts de Lyon, sur l'Utilité des Lichens dans la Médecine et dans les Arts*, par MM. G. F. Hoffman, Amoreux fils, et Willmet.—Lyon, 1787.

Borrichius, the Danish apothecaries were acquainted with them in 1673. In 1683, Hiärne spoke favourably of its effects in hæmoptysis and phthisis. (Murray, *App. Medicam.* v. 508.)

Botany. **Gen. Char.** — *Thallus* foliaceous, cartilagineo-membranaceous, ascending and spreading, lobed and laciniated, on each side smooth and naked. *Apothecia* orbicular, obliquely adnate with the margin of the thallus, the lower portion being free (not united with the thallus); the disk coloured, plano-concave, with a border formed of the thallus and inflexed (*Hooker*).

Sp. Char. — *Thallus* erect, tufted, olive brown, paler on one side, laciniated, channelled, and dentato-ciliate, the fertile lacinia very broad. *Apothecia* brown, appressed, flat, with an elevated border (*Hooker*).

The apothecia are generally wanting on the plant of the shops.

Hab.—Dry mountainous districts of the new and old continents. Although met with in considerable abundance in Scotland, it is never gathered there as an article of commerce.

Fig. 108.

Cetraria islandica.

a, The *apothecia* on the larger lobes of the thallus.

Physical Characters.—As met with in commerce, Iceland moss is brownish or grayish white, with white farinaceous spots on it, but rarely having apothecia. It has little or no odour, and a slightly bitter taste. Its powder (or *farina*) is whitish gray.

Commerce.—It is imported in barrels and bags from Hamburgh and Gothenburgh, and is said to be the produce of Norway and Iceland. In 1836, 20,599 lbs. paid duty; in 1837, 12,845 lbs.; in 1838, 6179 lbs.; in 1839, 15,933 lbs.; and in 1840, 6462 lbs.

Composition.—It has been analyzed by Berzelius (*Ann. de Chim.* xc. 277.) who obtained the following products from 100 parts:—*Starchy Matter* (lichenin,) 44·6; *Bitter Principle* (cetrarin), 3·0; *Uncrystallizable Sugar*, 3·6; *Chlorophylle*, 1·6; *Extractive Matter*, 7·0; *Gum*, 3·7; *Bilichenates of Potash and Lime* mixed with *Phosphate of Lime*, 1·9; and *Amylaceous Fibrin*, 36·2 (=101·6).

1. Lichenin.—The *starchy matter* or *feculoid substance of lichens* is somewhat different from ordinary starch. I have been unable to detect any particles analogous in their physical properties to those of other feculas. Payen, (*L'Institut. de* 1837, p. 145,) however, says he has seen the starch of Iceland Moss united in little balls. Water extracts a starchy substance. But no boiling, however long continued, deprives the insoluble texture of Iceland Moss of the property of being tinged blue by iodine, so that lichenin seems to enter into the constitution of the tissues of Iceland Moss. Lichenin is composed, according to Guerin-Vary, of C^{10} H^{11} O^{10}.

2. Cetrarin.—The *bitter principle* of this lichen is white, intensely bitter, soluble in alcohol (especially at a boiling temperature), ether, less so in water, volatile oil and creosote. It is coloured blue by hydrochloric acid when aided by heat; it combines with alkalis; and forms a red precipitate with the salts of iron, and a greenish one with those of copper. (Herberger, *Journ. de Pharm.* xxii.

3. Lichenic Acid.—This is composed of C^4 H^2 O^4. It forms a reddish precipitate with the salts of iron.

Chemical Characteristics.—Iceland moss swells up in cold water, to which it communicates a brownish tint. Boiled in water it yields a liquid which, when sufficiently concentrated, gelatinizes on cooling. The decoction, when cold, forms with iodine a blue compound (*iodide of starch*); with the sesquichloride of iron, a dingy purplish red (*cetrarate* and *lichenate of iron*); with diacetate of lead, a copious whitish precipitate (*amidate of lead*); with sulphate of copper and caustic potash, a green precipitate (*cetrarate of copper*).

Physiological Effects. *α. On Animals.*—In Carniola, pigs, horses, and oxen, are fattened by it. (Murray, *App. Med.* v. 506.

β. On man.—It is a mucilaginous or demulcent tonic, without any trace of astringency. If the bitter matter (*cetrarin*) and extractive be removed, it is nutritive, emollient, and demulcent, like ordinary starch, over which it has no advantage. Captain Sir John Franklin and his companions tried it as an article of food, when suffering great privations in America, but its bitterness rendered it hardly eatable.[1]

Uses.—Iceland Moss is well adapted to those cases requiring a nutritious and easily digested aliment and a mild tonic, not liable to disorder the stomach. It has been principally recommended in chronic affections of the pulmonary and digestive organs, particularly phthisis, chronic catarrh, dyspepsia, chronic diarrhœa, and dysentery; but its efficacy has been much exaggerated.

Administration.—It is best exhibited in the form of decoction. When employed as an alimentary substance merely, the bitter matter should be extracted before ebullition. This is effected by digesting the lichen in a cold weak alkaline solution (composed of water 300 parts, and carbonate of potash 1 part), and afterwards washing it with cold water.[2] It is then to be boiled in water or milk. When the decoction is sufficiently concentrated, it gelatinizes on cooling. It may be flavoured with sugar, lemon peel, white wine, or aromatics, and then forms a very agreeable kind of diet.

DECOCTUM CETRARIÆ, L.; U. S. *Decoctum Lichenis Islandici*, D.; *Decoction of Iceland Moss.* (Iceland Moss, ʒv.; Water, Ojss.; boil down to a pint, and strain. The *Dublin College* orders half an ounce of the moss to be digested for two hours in a close vessel with a wine pint of boiling water, then to be boiled for fifteen minutes, and the liquor strained while hot.) [The U. S. P. directs, Iceland Moss, ʒss., water, a pint and a half. Boil down to a pint and strain, with compression.] Dose, fʒj. to fʒiv. every four hours.

2. ROCEL'LA TINCTO'RIA, *De Cand. L. E. D.*—DYER'S ORCHIL OR ORCHELLA.

Sex. Syst. Cryptogamia, Algæ.

(Lacmus: Thallus præparatus, *L.*—Lacmus, *E.*—Litmus, *D.*)

History.—It is the πόντιον φύκος (*Mucus marinus*) of Theophrastus. (*Hist. Plant.* lib. iv. cap. 7.) By the moderns it was first employed as a dye at the commencement of the fourteenth century. (Beckmann, *Hist. of Invent. and Discov.* vol. i.

Botany. **Gen. Char.**—*Thallus* coriaceo-cartilaginous, rounded or plane, branched or laciniated. *Apothecia* orbicular, adnate with the thallus; the disk coloured, plano-convex, with a border at length thickened and elevated, formed of the thallus, and covering a sublentiform, black, compact, pulverulent powder concealed within the substance (*Hooker*).

Sp. Char.—*Thallus* suffruticose, rounded, branched, somewhat erect, grayish brown, bearing powdery warts. *Apothecia* flat, almost black and pruinose, with a scarcely prominent border (*Hooker*).

Hab.—Maritime rocks of the Canaries, Azores, southern coast of England, &c.

Commerce.—It is imported in bags from the Canaries (*Canary Weed*), the Azores (*Western Island Weed, St. Michael's Weed*), Cape de Verd Islands and Mogadore (*African* or *Mogadore Weed*). That from the Canaries is the most valuable. In 1838, 567 cwts., in 1839, 6494 cwts., and in 1840, 4175, cwts. of *Rocella tinctoria* and *fuciformis* paid duty.

[1] *Narrative of a Journey to the Shores of the Polar Sea*, p. 414. 1823.

[2] Dr. Davidson, in a paper *On the Removal of the bitter taste and lichenous odour of Iceland Moss* (Jameson's *Edinb. New Phil. Journ.* vol. xxviii. p. 250, 1840), recommends a solution of caustic potash for extracting the bitter taste of this lichen. A pound of carbonate of potash (rendered caustic by a pound of lime) is sufficient for 28 lbs. of the plant.

PHYSICAL PROPERTIES.—Both Rocella tinctoria and fuciformis are imported as orchil. I have met with the latter species in commerce under the name of *Madeira Weed*. It is distinguished from R. tinctoria by its larger size, its paler colour, and its broader flat fronds.

COMPOSITION.—Rocella tinctoria was analyzed by Fr. Nees v. Esenbeck, who found in it a *brown resin* (soluble in alcohol and ether, and becoming brownish red with ammonia), *wax*, *glutinous matter*, *insoluble starch*, *yellow extractive*, *yellowish brown gummy matter*, *lichenin*, *tartrate* and *oxalate of lime*, and *chloride of sodium* from the adherent sea water. (Nees v. Esenbeck and Ebermaier, *Hand. de Med. Pharm. Bot.* Bd. 1.)

More recently Dr. Kane (*Phil. Trans.* 1840, p. 273,) has submitted this plant to a very elaborate examination. The following substances, he states, either pre-exist in the lichen or are "produced immediately by the processes employed in its analysis:"—*Erythryline*, *Erythrine*, *Amarythrine*, *Telerythrine*, and *Rocelline*.

1. ERYTHRYLINE. A pale yellowish, often whitish substance, insoluble in water, but easily soluble in alcohol, ether, and alkaline solutions. From its solution in alkaline liquors it is precipitated by an acid. It is altered by boiling water: the liquid is then found to contain amarythrine. It is fusible at 212°. It consists of C^{22} H^{16} O^6.

2. ERYTHRINE; *Pseudo-erythrin* of Heeren. A crystalline substance, sparingly soluble in cold, abundantly soluble in boiling, water. It is very soluble in alcohol and ether. Its formula is C^{22} H^{12} O^9. It is formed by the action of air on erythryline.

3. AMARYTHRINE; *Erythrine-bitter*. Formed by dissolving erythrine in hot water, and exposing for some days to the air. A bitter sweet liquid is obtained of a pale brown colour. Amarythrine consists of C^{22} H^{13} O^{14}.

4. TELERYTHRINE. A crystalline neutral white substance obtained by exposing semifluid amarythrine for several months to the air. Its formula is C^{22} H^9 O^{13}.

5. ROCELLIC ACID of Heeren; *Rocelline* of Kane. A fatty crystallizable acid. Kane says its acid properties are not marked. Its formula, according to Liebeg, is C^{17} H^{16} O^4. Kane regards it as C^{20} H^{24} O^6.

CHEMICAL CHARACTERISTICS.—The aqueous decoction of Rocella tinctoria forms a copious precipitate with diacetate of lead, and has its colour deepened by alkalis. Digested in a weak solution of ammonia, in a corked phial, at a heat not exceeding 130° F., the plant yields a rich violet-red colour. This is *Hellot's test* for the discovery of a colorific property in lichens.[1]

PREPARATION OF ORCHIL.—Rocella tinctoria has been introduced into the London Pharmacopœia as the source of *litmus;* but this substance, though formerly procured from Rocella, according to Ferber, (Murray, *App. Med.* iv. 144,) is now probably prepared from Lecanora tartarea. (Nees and Ebermaier, *Handb.* i. 49; also Thomson, *Org. Chem.* 284.)

Orchil or *Archil* is the only colouring matter prepared from Rocella tinctoria in this country. *Blue Orchil* is procured by steeping the lichens in an ammoniacal liquor in a covered wooden vessel. *Red Orchil* is made with the same liquor in common earthen jars placed in a room heated by steam, and called *a stove*. In one manufactory which I inspected, the ammoniacal liquor was prepared by distillation from a mixture of lime, impure muriate or sulphate of ammonia obtained from gas-works, and water; but I am informed, that some makers still employ stale urine and lime.

The *theory* of the process is as follows: the *erythrine* which exists in the lichen absorbs oxygen and ammonia, and forms *Orcein;* the *rocelline* absorbs oxygen and forms *Erythroleic Acid;* these being kept in solution by the excess of ammonia, the whole liquid is of an intensely rich purple tint, and constitutes ordinary orchil (Kane).

PROPERTIES.—The liquor sold in the shops as orchil has a deep reddish pur-

[1] Berthollet, *On Dyeing*, by Ure, vol. ii. p. 184; also, *Proceedings of Comm. of Agric. of Asiatic Soc.*, April 8, 1837.

ple colour and an ammoniacal smell. It is reddened by acids which neutralize the ammonia which it contains.

Composition of Orchil.—According to Kane Orchil consists of *Orcein*, *Erythroleic Acid*, and *Azo-erythrine*. To these must be added *Ammonia*.

1. Azo-erythrine.—This is insoluble in water, in alcohol, and in ether; but it dissolves in alkaline liquors, giving the characteristic port-wine colour. Its formula is C^{22} H^{16} N O^{19} + 3 Aq. Its formation may be explained by supposing that one equivalent of Amarythrine C^{22} H^{13} O^{14}, one equivalent of ammonia H^3 N, five equivalents of atmospheric oxygen O^5, and three equivalents of water 3 Aq. form one equivalent of Azo-erythrine.

2. Orcein.—A crimson red powder, sparingly soluble in water and in ether, copiously soluble in alcohol. It dissolves in alkaline liquors, forming a magnificent purple. Ordinary Orchil contains an ammoniacal solution of this kind. Kane has described two forms of orcein:—

α. Alphaorcein consists of C^{18} H^{10} N O^5.

β. Betaorcein; Orcein of Robiquet, Dumas, and Liebig. It consists of C^{18} H N O^8.

In contact with deoxidizing agents it combines with hydrogen and forms *Leucorcein*, composed of C^{18} H^{10} N O^9 + H. Bleached by chlorine it yields *Chlororcein*, whose formula is C^{18} H^{10} N O^8 + Cl.

Alpha-orcein is probably formed by the conversion of one equivalent of azo-erythrine C^{22} H^{16} N O^{19} + 3 Aq. into four equivalents of carbonic acid C^4 O^8, nine equivalents of water H^9 O^9, and one equivalent of alpha-orcein C^{18} H^{10} N O^5. The latter absorbing three equivalents of oxygen O^3 becomes Beta-orcein C^{18} H^{10} N O^8.

3. Erythroleic Acid.—This is a crimson substance distinguished by its semifluid consistence at ordinary temperatures, and its solubility in ether. Dissolved in alkaline solutions, it forms a fine, purple-coloured liquor. Its formula is C^{26} H^{22} O^8. It is probably formed according to Kane by the abstraction of two equivalents of hydrogen from, and the addition of two equivalents of oxygen to, one equivalent of Rocellic acid C^{26} H^{24} O^6.

Uses.—Orchil is employed merely as a colouring agent. It is used for dyeing, colouring, and staining.

3. LECANO'RA TARTA'REA, *Ach.*—TARTAREOUS MOSS.

Sex. Syst. Cryptogamia, Algæ.

(Litmus, *Offic.*)

History.—The manufacture of a colouring matter from this plant was first started at Leith by Dr. Cuthbert Gordon, from whose name the word *Cudbear* originated.

Botany. **Gen. Char.**—*Thallus* crustaceous, spreading, plane, adnate, uniform. *Apothecia* (*patellulæ*) orbicular, thick, sessile, and adnate; the *disk* plano-convex; its *border* thickish, formed of the *crust* and of the same colour (*Hooker*).

Sp. Char.—*Crust* thick, granulated, and tartareous grayish white. *Apothecia* scatered; the *disk* convex, at length plane or tumid, yellow-brown, inclining to flesh colour; the *border* thick, inflexed, at length wavy (*Hooker*).

Fig. 109.

Lecanora tartarea.

Hab.—On rocks in Alpine countries, Norway, Scotland, &c.

Commerce.—It is imported from Norway and Sweden under the name of *White Swedish* or *Tartareous Moss*.

Preparation of Cudbear and Litmus.—In this country, *Red* and *Blue Cudbear* (in the form both of *powder* and *paste*) are prepared from this plant. In Holland, *Litmus* is made from it, according to Nees and Ebermaier (*Op. cit.*), and Thomson. (*Op. cit.*)

Cudbear (*Persio*) is procured in the manner of orchil, by the action of ammonia. When colour is developed, the decomposed lichen is sold either as *paste*, or dried and ground into *powder*.

Litmus (*Lacmus*, L. E.; *Litmus*, D.; *Lacca cærulea*, *Lacca musica*) is made by the Dutch, and is imported from Holland. Guibourt (*Hist. Des Drog.* 3me éd. ii. 143) thinks that it owes its colour to the *Crozophora tinctoria*. But on a microscopic examination of the litmus cakes of commerce, portions of the epidermis and meso-thallus of some lichen are found. My colleague, Mr. Quekett, who has carefully examined them, cannot decide whether they be the tissues of Rocella or of Lecanora. The precise mode of obtaining litmus is not known; but there is little doubt the process is somewhat analogous to that for making orchil. The lichen is said to be fermented in putrid (distilled?) urine.

Properties of Litmus.—Litmus occurs in small, cubical, light, and friable cakes of a dirty blue colour. Examined by the microscope, we find sporules, and portions of the epidermis and mesothallus of some species of lichen, moss leaves, silica, &c. When the cakes are thrown into dilute hydrochloric acid, effervescence takes place, and a solution of chloride of calcium is obtained, showing that they contain carbonate of lime. The blue colouring matter of litmus is soluble in both water and alcohol. It is reddened by acids, but restored by alkalis. Chlorine and the hypochlorites destroy it.

Composition.—The nature and properties of the colouring matters of litmus have been examined by Dr. Kane. From his investigations litmus appears to contain three colouring principles, namely, *Erythrolein*, *Erythrolitmine*, and *Azolitmine*. The characteristic blue colour of litmus depends on the combination of the two latter colouring matters with Lime, Potash, and Ammonia. Litmus also contains Lignin, Chalk, and Silica.

1. Erythrolein. This is semifluid at ordinary temperatures. It is soluble in alcohol and ether, yielding fine red solutions. With ammonia it forms a magnificent purple. Its formula is $C^{26}\,A^{22}\,O^{4}$. It is perhaps derived from Rocceline.

2. Erythrolitmine. This is a light red crystalline substance, sparingly soluble in water and in ether, but abundantly soluble in alcohol. It dissolves in a solution of potash or ammonia, forming a blue liquid. Its formula is $C^{26}\,H^{22}\,O^{12}$. It is probably formed by the oxidation of erythrolein.

3. Azolitmine. It is a brownish red powder. It is sparingly soluble in water and insoluble in alcohol and ether. Dissolved in a solution of potash or ammonia, it yields blue solutions. Its formula is $C^{18}\,H^{10}\,NO^{10}$. It therefore, differs from betaorcein in containing additional equivalents of oxygen. It is decolourized by deoxidizing agents yielding *Leucolitmine*.

4. Spaniolitmine. This is not a constant constituent of litmus. It is of a bright red colour, insoluble in alcohol and ether, and very sparingly soluble in water. Alkalis render it blue. Its formula is either $C^{16}\,H^{7}\,O^{16}$, or $C^{26}\,H^{11}\,O^{23}$. It is probably formed from erythrolitmine.

Uses.—Litmus is employed as a test for acids and alkalis. The former communicate a red colour to blue litmus: the latter restore the blue colour of reddened litmus.

1. TINCTURA LACMI; *Tincture of Litmus* (Litmus, *one part*; Water *twenty-five parts*. M.). This is chiefly a solution of azolitmine with sometimes spaniolitmine. When kept in a closely-stopped bottle its blue colour sometimes disappears, but is shortly restored on the admission of atmospheric air.

2. CHARTA LACMI; *Litmus Paper*. This is more delicate when made with bibulous or unsized paper, which is to be brushed over with a strong clear infusion of litmus. Faraday (*Chemical Manipulation*), recommends the infusion to be prepared from half an ounce of litmus and half a pint of water. The Prussian Pharmacopœia orders one part of litmus and four parts of water. When carefully dried, litmus paper should be preserved by wrapping it in stiff paper and keeping it in well-stopped vessels in a dark cupboard.

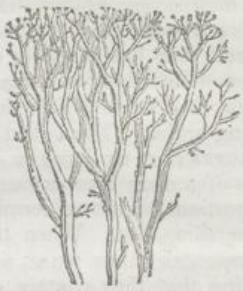
Blue Litmus Paper (*Charta exploratoria cærulea*) is prepared as above directed. *Reddened Litmus Paper* (*Charta exploratoria rubefacta*) is made with an infusion of litmus which has been feebly acidulated with acetic acid.

OTHER ESCULENT AND MEDICINAL LICHENS.

FIG. 110.

Tripe de Roche
(*Gyrophora.*)

FIG. 111.



Cladonia rangiferina.

It has been already stated (vol. i. p. 93) that several species of *Gyrophora* (*G. proboscidea* and *cylindrica*) are employed by the hunters of the Arctic regions of America as articles of food, under the name of *Tripe de Roche* (fig. 110.) *Cladonia rangifernia* or *Rein-Deer Moss* (fig. 111) is a well-known example of a nutritive lichen, supporting the animals after whom it is named when no other sustenance can be obtained.

Several lichens are employed as popular remedies for hooping-cough and pulmonary affections. Those usually kept by the herbalist are, *Sticta pulmonaria* (called *Oak lungs*), *Scyphophorus pyxidatus* (*Cup Moss*), and *Peltidea canina* (sold as *Ground Liverwort*). The first has been used in pulmonary affections. The second has long been celebrated as a remedy for convulsive cough.[1] The third and last one was formerly thought to be a specific for hydrophobia.

ORDER III.—FUNGI, *Juss.*—THE MUSHROOM TRIBE.

FUNGACEÆ, *Lind.*

ESSENTIAL CHARACTERS.—*Plants* consisting of *cells* and *fibres*, always springing from organized, and generally decayed or decaying substances, not perfected when immersed in water, bearing reproductive *sporidia*, either externally or internally, naked or inclosed in variously formed cells, many of which frequently concur in the reproduction of a single individual, varying extremely in substance and duration, generally soft and juicy, sometimes exceedingly hard, with or without a central gelatinous nucleus, or dry and powdery (*Berkeley*).

PROPERTIES.—Extremely variable: some fungi being highly nutritious, others very deleterious. No anatomical characters are known by which the poisonous can be distinguished from the esculent ones. A few species only have been used in medicine, and these are not uniform in their properties. The proximate principles peculiar to this order, which have been examined, are—1, *Fungin*, a nitrogenous, highly-nutritious, woody matter; 2, *Amanitin*, the active ingredient of some of the poisonous Agarici; 3, *Boletic acid*; 4, *Fungic acid*. Mushroom sugar has been found identical with mannite.

ERGOTÆTIA ABORTIFA'CIENS, *Quekett.*—THE ABORTIFACIENT ERGOTÆTIA.

Sex. Syst. Cryptogamia, Fungi.
(Ergota, *Offic.*)

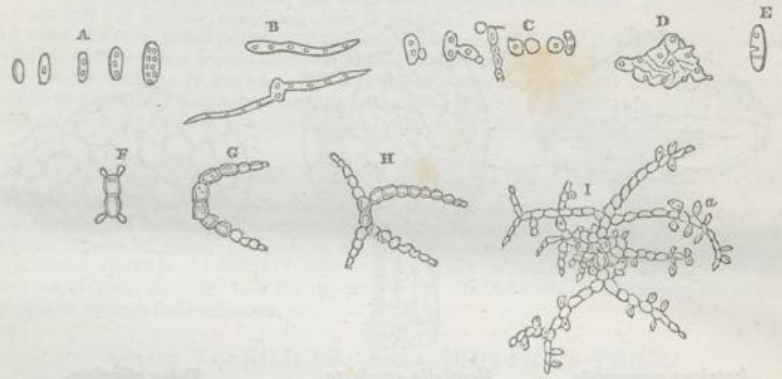
HISTORY.—This fungus was first described and named by my friend and colleague, Mr. Quekett, in a paper read before the Linnean Society, Dec. 4, 1838. (*Trans. Linn. Soc.* vol. xviii. p. 453.) An abstract of the paper was published in the *London Medical Gazette*, (see vol. xxiii. p. 606. Jan. 19, 1839.) Mr. Quekett named the plant *Ergotætia abortans* (*Ergotætia*, from *Ergot*, Fr., *Ergota*, Ph. Lond., and αἰτία, *origin*; *abortans*, in allusion to its destroying the germinating power of the grain of grasses, and also to the medicinal powers of ergot.) Subsequently, at my suggestion, he substituted the word *abortifaciens* for *abortans*. The sporidia of the plant are depicted by Phœbus, (*Deutschl. kryptog. Giftgewachse*, Taf. ix. Berlin, 1838). They were also noticed by

1 Dillenii, *Dissertatio de Lichene Pyxidato*, in Schlegel's *Thesaurus Materiæ Medicæ*, t. i. p. 307. Lipsiæ, 1793.

Phillipar. (*Traité Organogr. et Physiologico-agric. sur l'Ergot.* Versailles, 1837.)

BOTANY. **Gen. Char.**—*Sporidia* elliptical, moniliform, finally separating,

FIG. 112.



Ergotætia abortifaciens.

A, Sporidia.
B, C, E, F, G, H, different modes of reproduction in water.
D, Membrane of sporidium laid open.
I, The fungus assuming a radiated form, and beginning to develope sporidia upon its branches in water.

transparent, and containing seldom more than one, two, or three well-defined (greenish) granules.

Sp. Char.—Only one species known.

Hab.—Florel envelopes, and ovaria of grasses: Europe, America.

Sometimes the sporidia are slightly contracted about their middle. They contain usually one, two, or three, but occasionally as many as ten or twelve, well-defined green granules. The sporidia are, on the average, about 1-4000th of an inch long, and 1-6000th of an inch broad. When placed on glass and moistened with water, they readily germinate or produce other plants, though in various ways, as sometimes by emitting tubes (B); by the development of buds (C); and by the formation of septa across their interior (E, F, G, H) (*Quekett*). This plant belongs to the *Coniomycetes* of Fries, tribe *Mucedines*; and to the tribe *Sporidesmiei* of Berkeley.

By the growth of these fungi upon or within the ovarium of grasses, a diseased condition of the ovarium, involving the whole of the embryo, and sometimes partially or wholly the albumen, is produced, called the *ergot* or *spur*, which will be described hereafter [*vide* GRAMINEÆ]. Mr. Quekett (*Lond. Med. Gaz.* Oct. 8, 1841,) has shown that the sporidia of this fungus are capable of infecting healthy grains of corn, and of ergotizing them.

PROPERTIES.—The chemical properties and physiological effects of this fungus are at present quite unknown. We have yet to learn, whether the peculiar properties of ergotized grass depend on the fungi, or on the morbid products of the ovarium.

OTHER ESCULENT, MEDICINAL, OR POISONOUS FUNGI.

1. *Fungi esculenti.*—*Esculent Fungi.*

I have already offered some remarks on the dietetical qualities of fungi (see vol. i. p. 93).

2. Fungi occasionally used in Medicine.

The internal portion of *Polyporus igniarius (Boletus igniarius)*, commonly called *Agaric of the Oak*, *Touchwood*, or *Spunk*, cut in thin slices, and beaten with a hammer until soft, has

Fig. 113. Fig. 114. Fig. 115.

Agaricus campestris. *Morchelia esculenta.* *Tuber cibarium.*

been applied, as a styptic, to restrain hæmorrhages; but its action is mechanical, like lint: that is, it absorbs the blood, and promotes coagulation. *Polyporus fomentarius (real Amadou)* has also been used for similar purposes. The substance sold in the shops as *Amadou*, or *German tinder*, is prepared from both species, by cutting the fungus in slices, beating, and soaking it in a solution of nitre. Mr. Wetherfield (*Lond. Med. Gaz.* November 26, 1841.) recommends it as an elastic medium for applying support and pressure, and as a defence to tender and inflamed parts. It does not lose its elasticity like lint. *Polyporus Laricis (P. officinalis, Boletus purgans*, or *Larch Agaric)* was formerly used as a drastic purgative, in doses of from a scruple to two drachms, and it is still kept by the herbalist. Mr. Butler, of Covent Garden Market, informs me that it is imported from Germany, but that there is very little sale of it. The dust (*sporidia*) of *Lycoperdon (Puff Ball)* was formerly used as a styptic; the smoke is used for stupefying bees.

3. Fungi venenati.—Poisonous Fungi.

Fig. 116.

Poisonous Indigenous Agarici of the section Amanita.

a, Agaricus vernus, *Bull.*
b, " phalloides, *Fries.*
c, " porphyrius, *Fries.*
d, " vaginatus, *Bull.*
e, Agaricus nivalis, *Grev.*
f. f. " muscarius, *Linn.*
g. " pantherinus, *Dec.*

All poisonous fungi are called by the public *Toadstools*. Those of the genus *Agaricus*, section *Amanita*, are the most important, because the most likely to be confounded with edible species (as with *Agaricus campestris*). The Russians, who eat no less than sixteen species of

Agaricus, (Dr. Lefevre, *Lond. Med. Gaz.* xxiii. 414,) never employ any belonging to the section *Amanita*.[1]

The symptoms produced by poisonous fungi are those indicating gastro-intestinal irritation (nausea, vomiting, purging, and abdominal pain), and a disordered condition of the nervous system (delirium, stupor, blindness, convulsions, muscular debility, paralysis, and drowsiness). In some cases, the power of the vascular system is remarkably depressed, the pulse being small and feeble, the extremities cold, and the body covered with a cold sweat. At one time, local irritation only; at another, narcotism alone is produced.[2]

In some cases the active principle of poisonous fungi seems to be a *Volatile acrid principle:* in other instances it is a brown, uncrystallizable solid, called by Letellier *amanitin*.

No specific antidote is known. The first object, therefore, is to expel the poison from the stomach and bowels. The subsequent treatment will depend on the nature of the symptoms which manifest themselves, and must be conducted on general principles.[3]

Order IV.—LYCOPODIACEÆ, *De Cand.*—THE CLUB-MOSS TRIBE.

The powder sold in the shops as *Lycopodium*, *Witch-meal*, or *Vegetable Sulphur*, is procured from *Lycopodium clavatum* (*Common Club-moss.*) It consists of extremely small pale yellow particles, (*sporules? pollen??*) which, in the plant, are contained in two-valved, one-celled capsules, (*thecæ*, *sporangia? anthers??*) lodged in the axillæ of the bracteal leaves. It is sometimes employed in medicine as a dusting powder for children; and, in pharmacy, for enveloping pills to prevent their adhesion.

Order V.—FILICES, *Juss.*—THE FERN TRIBE.

(Filicales, *Lind.*)

Essential Character.—Herbaceous plants with a perennial *rhizome*, more rarely having an erect arborescent trunk [when they are called tree ferns, *filices arboreæ*; fig. 117]: *trunk* coated, of a prosenchymatous structure, with the entire cylinder of woody fasciculi divided into two concentric parts, the one narrow, placed between the bark and the wood, the other larger, central, medullary, sending fasciculi of vessels towards the petioles, and communicating with the exterior by means of chinks in the woody cylinder. *Leaves* [*frondes*] scattered upon the rhizome or rosaceo-fasciculate on the apex of the caudex, with circinnate vernation, annual or perennial, the base of the petioles persistent, growing to the caudex; simple or pinnate, entire or pinnatified, [equal-] veined, (the veins composed of elongated cells), frequently having cuticular *stomata*. *Sporangia* [*thecæ*], placed on the veins of the back or margin of the leaves, collected in little naked heaps [*sori*], or covered with a membranous scale [*indusium*], or transmuted margin of the leaf, pedicellate [with the stalk (*seta*), passing round them in the form of an elastic ring (*annulus*)], or sessile, unilocular, indefinitely dehiscent. *Spores* [*sporules*] numerous, free, globose, or angular, in germination at first elongated in every direction, throwing out radicles downward, and the caulículus upward. (Endlicher, *Genera Plantarum.*)

Fig. 117.

A Tree Fern.

[1] For some remarks on the Fungi used as food by the Russians, see Lyall's *Character of the Russians and a detached History of Moscow*, p. 356. Lond. 1823.

[2] For illustrations of the effects of particular species, see vol. i. p. 126 of this work, and consult Phœbus, *Deutschl. kryptog. Giftgewächse*, 1838; and Letellier, *Journ. de Pharm.* Août. 1837.

[3] For further information, respecting poisonous fungi, consult Christison's *Treatise on Poisons.*

PROPERTIES.—The leaves are mucilaginous, and frequently slightly astringent and aromatic. The rhizomes contain starch, usually tannic acid with more or less bitter matter, and sometimes both fixed and volatile oil, with some rezin. They are mild astringent tonics. The rhizome of *Nephrodium Filix mas* is celebrated as a vermifuge; that of *Polypodium Caliguala* as a diaphoretic and diuretic in rheumatic and venereal diseases. (Lambert's *Illustrations of the genus Cinchona*, p. 125. 1821.

NEPHRO'DIUM FI'LIX MAS, *Richard*, E.—MALE SHIELD FERN.

Aspidium Filix mas, *L. D.*

Sex. Syst. Cryptogamia, Filices.

(Aspidium: radix, *L.*—Rhizoma, *E.*—Radix, *D.*)

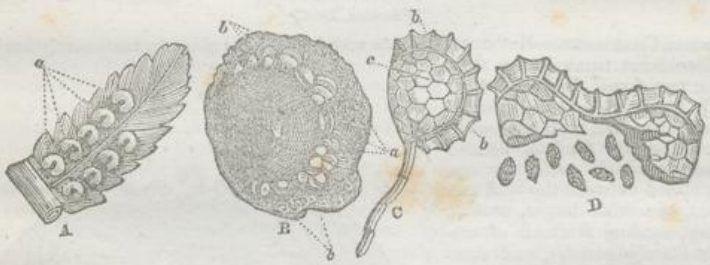
(Filix mas, U. S.)

HISTORY.—This plant was known to Theophrastus, Dioscorides, and Pliny. The two first call it πτέρις, the latter *Filix mas*.

BOTANY. **Gen. Char.**—*Sori* roundish, scattered. *Indusium* orbiculari-reniform, fixed by the sinus.

Sp. Char.—*Fronds* bipinnate, pinnules oblong, obtuse serrated, their stalk and midrib chaffy. *Sori* near the central nerve (*Hooker*).

FIG. 118.



Nephrodium Filix mas.

A. Pinnule with nine sori (*a*).
B. Magnified portion of pinnule with the sporangia. *a*. Stomata. *b, b*. Sporangia partially covered by *c*. the indusium.
C. Magnified sporangium. *a*. Stalk. *b*. Ring. *c*. Membranous sac.
D. Ruptured sporangium, with the sporules escaping.

The rhizome is large, tufted, and scaly. The leaves grow in a circle to a height of 3 or 4 feet.

Hab.—It is an indigenous plant, frequent in woods and in shady banks. It is a native of other parts of Europe, of Asia, of the North of Africa, and of the United States of America.

DESCRIPTION.—The subterraneous stem (*rhizoma; caudex; fern root, radix filicis*, officin.) lies obliquely in the ground. It varies in length and breadth according to its age. For medical purposes it should be from three to six or more inches long, and from half an inch to an inch or more broad. It is almost completely enveloped by the thickened bases of the footstalks of the fallen leaves. These bases (sometimes called tubercles) are arranged closely around the rhizome in an oblique direction, overlapping each other. They are one or two inches long, from three to five lines thick, curved, angular, brown, surrounded near their origin from the rhizome by two or more shining, reddish yellow, thin, silky scales (*ramenta*). The radicle fibres (root, properly so called) arise from the rhizome between these footstalks. The fern root of the shops consists of fragments of the dried thickened bases of the footstalks, to which small portions of the rhizome are found adhering, and of the root fibres.

Internally, the rhizome and footstalks are, in the present state, fleshy, of a

light yellowish-green colour; but in the dried state, yellowish or reddish white. Iodine colours the fresh rhizome bluish black, indicating the presence of starch; particles of which may be recognized by the microscope. In a transverse section of the rhizome we observe five or six, or more, bundles of woody fibres and scalariform ducts. These bundles are arranged in a circle, are of a reddish white colour in the recent rhizome, but yellow in the dried one.

The dried root has a feeble, earthy, somewhat disagreeable odour. Its taste is at first sweetish, then bitter astringent, and subsequently nauseous, like rancid fat.

Collection.—The rhizome should be collected in the month of July, August, or September. The black portions, fibres, and scales, are to be removed, and the sound parts carefully dried and reduced to powder: this is of a yellowish colour, and is to be preserved in well-stoppered bottles. Both the whole rhizome and powder deteriorate by keeping.

Fern buds (*gemmæ filicis maris*) which are sometimes employed in medicine, are to be collected in the spring.

Composition.—Fern rhizome was analysed in 1805 by Vauquelin, (*Ann. Chim.* lv. 31,) in 1821 by Gebhard, (*Diss. inaug.* in Pfaff's *Syst. d. Mat. Med.* 7er Bd. 219,) in 1824 by Morin, (*Journ. de Pharm.* x. 223,) in 1826 by Wackenroder, (*De Anthelm. regni Vegetab.*) and by Geiger, (*Handb. d. Pharm.* 1829.) Subjoined are the results of the analyses of Geiger and of Morin:—

Geiger.		*Morin.*
Green fat oil,	6·9	Volatile oil.
—— resin,	4·1	Fixed oil (stearin and olein).
Uncrystallizable sugar,	22·9	Tannin.
Easily oxidizable tannin,		Gallic and acetic acids.
Gum and salts, with sugar and tannin,	9·8	Uncrystallizable sugar.
Ligneous Fibre and starch	56·3	Starch.
	100·0	Gelatinous matter, insoluble in water and alcohol.
		Ligneous fibre.
		Ashes (carbonate, sulphate, and hydrochlorate of potash, carbonate and phosphate of lime, alumina, silica, and oxide of iron.)

The anthelmintic property of the rhizome resides in the oil (*oleum filicis maris*). Batso (*Inaug. Diss.* 1826, quoted in Goebel and Kunze's *Pharm. Waarenk.*) found a peculiar acid (*acidum filiceum*) and an alkali (*filicina*) in the rhizome.

Fern buds contain, according to Peschier, (quoted by Soubeiran, *Nouv. Traité de Pharm.* t. ii. p. 156, 2nde ed.) *a volatile oil, brown resin, fat oil, solid fatty matter, green colouring principle, a reddish brown principle, and extractive.*

Characteristics.—The presence of tannic acid in the aqueous decoction of fern rhizome is shown by the sesquisalts of iron producing a dark green colour (*tannate of iron*), and by a solution of gelatin causing a yellowish precipitate (*tannate of gelatin.*) No indication of the presence of a vegetable alkali in the decoction, can be obtained by tincture of nutgalls. If the rhizome be digested in alcohol, and afterwards boiled in water, the decoction when cold forms, with a solution of iodine, a dingy blue precipitate (*iodide of starch.*)

Physiological Effects.—These are not very obvious; but they are, probably, similar to those caused by other astringents. Large doses excite nausea and vomiting.

Uses.—It is only employed as an anthelmintic. Theophrastus, Dioscorides, Pliny, and Galen, used it as such. The attention of modern practitioners has been directed to it principally from the circumstance of its being one of the remedies employed by Madame Nouffer, the widow of a Swiss surgeon, who sold her secret method of expelling tape-worm to Louis XVI. for 18,000 francs.[1] At the present time fern rhizome is but seldom employed in this country, partly because the efficacy of Madame Nouffer's treatment is referred to the drastics

[1] *Trait. contre le Tænia*, &c. 1776, quoted by Bremser, *Sur les Vers Intest.*

used, and partly because other agents (especially oil of turpentine) have been found more effectual. "It is an excellent remedy," says Bremser, (*Op. cit.* p. 422,) "against *Bothriocephalus latus* [the tapeworm of the Swiss], but not against *Tænia Solium* [the tape-worm of this country]; for though it evacuates some pieces of the latter, it does not destroy it."

ADMINISTRATION.—It may be administered in the form of powder, of oil or ethereal extract, or of aqueous decoction. The dose of the recently-prepared powder is from one to three drachms. Madame Nouffer's *specific* was two or three drachms of the powder taken in from four to six ounces of water in the morning fasting, and two hours afterwards a *purgative bolus*, composed of calomel ten grains, scammony ten grains, and gamboge six or seven grains. The bolus was exhibited to expel the worm which the fern rhizome was supposed to have destroyed.

The *Ethereal Tincture of Male Fern Buds* (prepared by digesting 1 part of the buds in 8 parts of ether) has been used with success by Dr. Peschier (brother of the chemist of that name), and by Dr. Fosbroke (*Lancet* for 1834-35, vol. ii. p. 597,) as a vermifuge.

OLEUM FILICIS MARIS; *Oil of Male Fern.*—The impure oil of fern (called *oleum Filicis Peschieri, extractum filicis æthereum*, seu *balsamum filicis*,) recommended by Peschier, (*Journ. génér. de Med.* 1825, p. 375,) is an ethereal extract, and is composed, according to its proposer, of a *fatty matter, resin, volatile oil, colouring matter, extractive chloride of potassium*, and *acetic acid*. A pound of the rhizome yielded Soubeiran (*Nouve Traité de Pharm.* ii. 161, 2nde ed.) an ounce and a half of thick black oil, having the aromatic odour of fern. It may also be prepared from the buds as above stated. The dose is from half a drachm to a drachm, in the form of electuary, emulsion, or pills: an hour afterwards, an ounce or an ounce and a half of castor oil should be exhibited. Numerous testimonies of its efficacy have been published. (Dierbach, *Neuesten Entd. in d. Mat. Med.* 1er Band, 1837.) By substituting alcohol for ether, twelve or thirteen drachms of oil can be obtained from $2\frac{2}{3}$ lbs. of the rhizome, (*Journ. de Chim. Méd.* t. v. 2nde Sér. p. 68.)

Division II. Phanerogamia, *Auc.*—Flowering Plants.

COTYLEDONEÆ, *Juss.*—EMBRYONATÆ, *Rich.*—VASCULARES, *De Cand.*

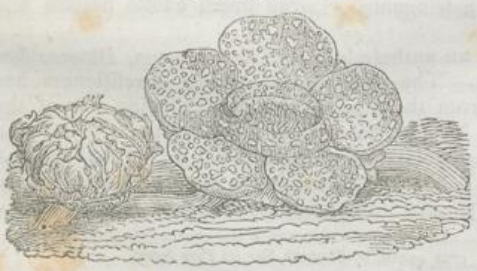
ESSENTIAL CHARACTER.—Substance of the plant composed of cellular tissue, woody fibre, ducts, and spiral vessels. *Leaves* usually present: *cuticle* with stomata. *Flowers* with perceptible stamens and pistils. *Seeds* generally with an embryo inclosed within a spermoderm, furnished with one or more cotyledons.

1. RHIZANTHEÆ, *Blume.*—RHIZANTHS.

ESSENTIAL CHARACTER.—Parasitical leafless plants. *Stem* homogeneous. Vascular system scarcely present. *Flowers* propagated by the agency of sexes. *Seeds* having no embryo, but consisting of a homogeneous sporuliferous mass. (*Lindley*).

ORDER VI.—RAFFLESIACEÆ, *Endl.*

FIG. 119.



Rafflesia Arnoldi.

In this Order is contained the *Rafflesia Arnoldi* (fig. 119), one of the wonders of the vegetable world. The diameter of the flower is $3\frac{1}{2}$ feet, the weight 15 lbs. The hollow in its centre is capable of holding twelve pints! It grows in Java, on the stems and roots of *Cissus angustifolia*. (Vide *Trans. Linn. Society*, vol. xiii.)

A decoction of this plant is used in Java as an astringent appplication in relaxed conditions of the vagina.

2. ENDOGENEÆ, *De Cand.*—ENDOGENS.

MONOCOTYLEDONES, *Juss.*

FIG. 120.

Endogens, or *Monocotyledons*.

q. Transverse section of an endogenous stem, showing the absence of medullary rays and of annual layers.
u. Stem and leaves of an endogen, showing the alternated sheathing leaves, with parallel veins.
r. Germinating seed of *Tradescantia cristata*, showing the plumule rupturing the coleoptilum, with the radicle and radicels.
s. Sections of a germinating seed, showing the cotyledon remaining in the testa.
t. Germinating embryo of a grass, to show the two alternate cotyledons of unequal size, with the intermediate plumule.

ESSENTIAL CHARACTER.—*Trunk* usually cylindrical, when a terminal bud only is developed, becoming conical and branched when several develope: consisting of cellular tissue, among which the vascular tissue is mixed in bundles, without any distinction of bark, wood, and pith, and destitute of medullary rays; increasing in diameter by the addition of new matter to the centre. *Leaves* frequently sheathing at the base, and not readily separating from the stem by an articulation, mostly alternate, with parallel simple veins, connected by smaller transverse ones. *Flowers* usually having a ternary division; the calyx and corolla either distinct or undistinguishable in colour and size, or absent. *Embryo* with but one cotyledon; if with two, then the accessory one is imperfect, and alternate with the other; *radicle* usually inclosed within the substance of this embryo, through which it bursts when germinating (*Lindley*).

ORDER VII.—GRAMINEÆ, *R. Brown.*—THE GRASS TRIBE.

(Gramina, *Juss.* Graminaceæ, *Lind.*)

ESSENTIAL CHARACTER.—*Flowers* usually hermaphrodite, sometimes monœcious or polygamous; consisting of imbricated bracts, of which the most exterior are called *glumes*, the interior immediately inclosing the stamens *paleæ*, and the innermost at the base of the ovarium *scales*. *Glumes* usually two, alternate; sometimes single; most commonly unequal. *Paleæ* two, alternate; the lower or exterior, simple; the upper or interior composed of two, united by their contiguous margins, and usually with two keels—together forming a kind of dislocated calyx. *Scales* two or three, sometimes wanting; if two, collateral, alternate with the paleæ, and next the lower of them, either distinct or united. *Stamens* hypogynous, one, two, three, four, six, or more, one of which alternates with the two hypogynous scales, and is, therefore, next the lower paleæ; *anthers* versatile. *Ovary* simple; *styles* two, very rarely one or three; *stigmas* feathery and hairy. *Pericarp* usually undistinguishable from the seed, membranous. *Albumen* farinaceous; *embryo* lying on one side of the albumen at the base, lenticular, with a broad cotyledon and a developed plumule; and occasionally, but very rarely, with a second cotyledon on the outside of the plumule, and alternate with the usual cotyledon.—*Rhizoma* fibrous or bulbous. *Culms* cylindrical, usually fistular, closed at the joints, covered with a coat of silex. *Leaves* alternate, with a split sheath. *Flowers* in little spikes, called *locustæ*, arranged in a spiked, racemed, or panicled manner (*Lindley*).

PROPERTIES.—Almost every species is esculent and salubrious. The nutritive property is especially remarkable in the seeds of grasses, which contain *starch*, *gluten*, *gum*, and *sugar*. The stems and leaves also contain sugar, mucilage, and starch. Cane-sugar is procured from the stem of a grass. Both stems and leaves are used as food for cattle. Even the

subterraneous stems and roots of some species (as *Triticum repens* and *Cynodon Dactylon*) abound in these principles. Considered in a medicinal point of view, the products of the grasses are emollient and demulcent.

To these statements there are a few exceptions, some of which have been already noticed (vol. i. p. 114.)

Odorous volatile oil is found in some species; as in *Anthoxanthum odoratum; Andropogon muricatus*, the fibrous roots of which are sold by perfumers under the Tamool name of *Vittie Vayr; Andropogon Schœnanthus*, which yields the *Oil of Lemon-Grass;* and *Andropogon Calamus aromaticus*, Royle (*A. nardoides*, Nees ab Esenb.), from which the *Grass-oil of Namur* is obtained. (Royle's *Essay on the Antiq. of Hindoo Med.* p. 34.)

1. SAC'CHARUM OFFICINA'RUM, *Linn. E. D.*—THE SUGAR CANE.

Saccharum officinale, *L.*

Sex. Syst. Triandria, Digynia.

(Sacchari fæx; Saccharum: Succus præparatus, *L.*—Saccharum commune; Sacchari Faex; Saccharum purum, *E.*—(Saccharum, U. S.)—Succus concretus, *a.* non purificatus, *b.* purificatus; Syrupus empyreumaticus, anglice *molasses*, *D.*)

History.—The manufacture of sugar is said by Humboldt to be of the highest antiquity in China. Cane sugar was known to the ancient Greeks and Romans, and was considered by them to be a kind of honey. Possibly, Herodotus (*Melpomene*, cxciv.) refers to it when he says that the Zygantes make honey in addition to that which they get from bees. Theophrastus (*De Melle,*) calls it *mel in arundinibus;* Dioscorides (Lib. ii. cap. civ.) terms it σάκχαρον; Pliny (*Hist. Nat.* lib. xii. cap. xvii.) *saccharum*. Humboldt (*Journ. of Science and Arts*, vol. v. p. 15.) adopts too hastily, I think, the opinion of Salmasius, that the latter writers meant the siliceous product of the Bamboo, viz., *Tabasheer;* for, in the first place, as they arrange it with honey, it was probably sweet, which tabasheer is not; secondly, the Sanscrit name for sugar is *Sarkura;* (Royle's *Essay*, p. 83.) thirdly, a passage in Lucan (Lib. iii. v. 237.) seems distinctly to refer to the sugar cane—"Quique bibunt tenera dulces ab arundine succos." Surely no one will pretend that the bamboo is a "tenera arundo?"[1]

Botany. **Gen. Char.**—*Spikelets* all fertile, in pairs, the one sessile, the other stalked, articulated at the base, two-flowered, the lower floret neuter, with one paleæ, the upper hermaphrodite, with two paleæ. *Glumes* two, membranous. *Paleæ* transparent, awnless, those of the hermaphrodite flower minute, unequal. *Stamens* three. *Ovary* smooth. *Styles* two, long; *stigmas* feathered, with simple toothletted hairs. *Scales* two, obscurely two or three-lobed at the point, distinct. *Caryopsis* smooth (?), loose (?) (*Kunth*).

Sp. Char.—*Panicle* effuse. *Flowers* triandrous. *Glumes* obscurely one-nerved, with very long hairs on the back (*Kunth*).

Fig. 121.

Saccharum officinarum.

The stem is solid, from six to twelve feet high. Leaves flat. Panicle terminal, from one to three feet long, of gray colour, from the long soft hair that surrounds the flower. Paleæ rose-coloured. Four varieties of the sugar cane are admitted.

α commune, with a yellow stem.
β purpureum, with a purple stem, yielding a richer juice.
γ giganteum, with a very large light-coloured stem.
δ tahitense, from Otaheite, said to make the finest sugar. (Porter's *Nat. and Prop. of the Sugar Cane*, p. 28, 1830.

Hab.—It is cultivated in both Indies. Its native country is uncertain.

Manufacture of Sugar.—The canes, when ripe, are cut close to the ground, stripped of leaves, and carried in bundles to the mill-house, where they are twice subjected to pressure between iron rollers, placed

[1] References to passages in other ancient authors will be found in the notes to Valpy's edit. of Pliny's *Hist. Nat.* vol. iv. 2193. See also Moseley's *Treatise on Sugar.* Lond. 1799.

either vertically or horizontally. The *cane-juice* thus procured is an opaque liquid, of an olive green colour, saccharine taste, and balsamic odour. Its specific gravity is 1·033 to 1·106. It consists of *water*, *sugar*, *gum*, *green fecula*, *extractive*, *gluten*, *acetic and malic acids*, *acetates of lime and potash*, *supermalate and sulphate of lime*, and *lignin* in the form of fragments of the cellular and fibrous tissues of the canes.

From the mill the juice is conveyed to a copper cauldron, called the *clarifier*, where it is mixed with lime, and heated. The clear liquor is then drawn off and put into a copper *boiler*, where it is evaporated and skimmed. It is then conveyed through a series of boilers, the last of which is called the *teache*. When it has acquired the proper tenacity and granular aspect, it is passed into a wooden *cooler*, where it is allowed to crystallize or *grain*. The concrete sugar is then placed in casks (usually sugar hogsheads) with holes in the bottom, each of which is partially closed by the stalk of a plantain leaf. Here the sugar is allowed to drain for three or four weeks. It is then packed in hogsheads and sent to this country under the name of *Muscovado* or *Raw Sugar*. The uncrystallized portion is termed *Molasses;* it is brought to England in casks. In Jamaica a mixture of water and molasses, with the skimmings of the clarifier and evaporating coppers, is fermented, and a vinous liquor thereby obtained, which, by distillation and rectification, yields *Rum*. (Vide vol. i. pp. 311 and 322.)

Sugar Refining.—Raw sugar contains several impurities, from which it is freed by refining. The eye recognizes the colouring matter. In an aqueous solution, lime is detected by oxalic acid, which throws down the white oxalate of lime; tannic acid by the dark colour produced on the addition of sesquichloride of iron, and by the precipitate formed by gelatin; glutinous and gummy matter by diacetate of lead; and free acid by litmus. By keeping, *strong* raw sugar becomes *weak*, that is, soft, clammy, and gummy. This change Mr. Daniell (*Quart. Journ. of Science*, vi. 38) ascribes to the action of the lime.

The following is an outline of the refining method which I saw practised at a large sugar-house in town:—Raw sugar is dissolved in water by the aid of steam (this process is called a *blow-up*). The liquid is then heated with bullock's blood (technically called *spice*), and sometimes with hydrate of alumina (termed *finings*), and filtered through canvas. The clear liquor is allowed to percolate slowly through a bed of coarse-grained animal charcoal nearly three feet deep, placed on a woollen cloth, supported on a false bottom of basket-work, and contained in a large wooden vessel. The filtered liquor, which is nearly colourless, is conveyed to a copper vessel (Howard's *vacuum-pan*), where it is boiled by the aid of steam, under diminished atmospheric pressure. The consistence of the liquid is examined from time to time by taking out a sample by the *proof-stick*, which is so constructed as not to admit air.

When the requisite degree of concentration has been attained, a valve is opened in the bottom of the vacuum-pan, and the syrup allowed to escape into a copper vessel (*heater*), enveloped by a jacket, so as to enable it to be heated by steam. The syrup is then transferred to conical moulds (made of earthenware or iron), whose orifices are closed by a paper plug, and the next morning, when solidified, these moulds are carried to the *curing-floor*, when the stoppers are withdrawn and the moulds placed in pots, in order to allow the *green syrups* to drain off: these are made into an inferior sort of refined sugar (*brown lumps*). The loaves are then either *clayed* or *sugared*. *Claying*[1] consists in pouring clay and water on the base of the sugar-loaf: the water slowly percolating through the sugar, a portion of which it dissolves, carries with it the colouring matter and other impurities. *Sugaring* is effected by substituting a saturated

[1] "Claying Sugar, as they report here, was first found out in Brazil: a hen having her feet dirty, going over a pot of Sugar by accident, it was found under her tread to be whiter than elsewhere."—Sloane's *Jamaica*, vol. i. p. 61.

solution of pure sugar (called *liquor*) for the clay and water: it dissolves the colouring matter but not the pure sugar. The loaves are afterwards dried in a stove, and put in blue paper for sale.[1]

The following may be regarded as an approximation to the produce of 112 lbs. of raw sugar by the above process:—

Refined Sugar	79lbs.
Bastard	17
Treacle	16 (12lbs. solid matter.)
Water	4
Raw Sugar	112

Properties.—Common sugar, when pure, is white and odourless. It is the sweetest of all kinds of sugar. By the slow evaporation of its aqueous solution, it crystallizes: in this state it is called *White Sugar Candy* (*Saccharum candum album*). The crystals are colourless; have, for their form, the oblique rhombic prism; and in consequence have two axes of no double refraction. Their sp. gr. is 1·6065. Common sugar is permanent in the air, and phosphorescent in the dark on being struck or rubbed. When heated, it melts, and soon becomes coloured. By this process its tendency to crystallize is diminished or destroyed. Sugar thus altered by heat and flavoured constitutes several preparations of the confectioner; as *Barley Sugar*, (*Saccharum hordeatum*), &c. If the melted sugar be rapidly and repeatedly extended, it becomes opaque and white: in this state, it is called *Penides* (*Saccharum Penidium*). When sufficiently heated, sugar becomes brown, evolves a remarkable odour, loses its sweet taste, and acquires bitterness: in this state, it is called *Burnt Sugar*, or *Caramel* (*Saccharum tostum*). Caramel enjoys acid properties, and is composed (Peligot, *Ann. Chim. et de Phys.* lxvii. p. 175) of C^{24} H^{18} O^{18}. Common sugar is very soluble in water: a saturated solution of it is called *Syrup:* it is thick, adhesive, and, by drying on paper, forms a kind of varnish. A watery solution of sugar, aided by heat, decomposes some of the metallic salts (as those of copper, mercury, gold, and silver); but several of them (as the diacetate of copper and nitrate of silver) require nearly a boiling temperature to change them. Sugar promotes the solubility of lime in water, and forms both a soluble and an insoluble compound with oxide of lead. It is soluble in alcohol, but not so in ether. A dilute watery solution of common sugar, with a little yeast, undergoes the vinous fermentation.

1. Purified or Refined Sugar. (*Saccharum*, L.; *Saccharum purum*, E.; *Succus concretus purificatus*, D.; *Saccharum purificatum*) is met with in the shops in conical loaves (*Loaf Sugar*) or truncated cones called lumps (*Lump Sugar*) of various sizes and degrees of purity. Small lumps are called *Titlers*. The finest refined sugar (*Saccharum albissimum*) is perfectly white, and is termed *double refined;* the inferior kind (*Saccharum album*) has a slightly yellowish tint, and is called *single refined*. Both varieties are compact, porous, friable, and made up of small crystalline grains.

2. Brown Sugar (*Saccharum commune*, E.; *Saccharum fuscum; Succus concretus non purificatus*, D.) occurs in commerce in the form of a coarse powder composed of shining crystalline grains. It is more or less damp and sticky, and has a peculiar smell and a very sweet taste. Its colour is brownish yellow, but varying considerably in intensity. *Muscovado* or *raw sugar* has the deepest colour, and is intermixed with lumps. *Bastard* is a finer kind, prepared from molasses and the green syrups. The *Demerara crystal sugar* is the finest: its colour is pale yellow, and its crystals are larger and more brilliant than the preceding varieties.

3. Treacle (*Fæx Sacchari*, L. E; *Syrupus empyreumaticus, anglicè Molasses*, D.) is the viscid, dark brown, uncrystallizable syrup which drains from the sugar-refining moulds. It is thicker than the West Indian molasses, and has a different flavour. Its sp. gr. is generally 1.4; and it contains, according to Dr. Ure, on an average, 75 per cent. of solid matter.

Chemical Characteristics.—Sugar is known by its sweet taste, its solubility in hot and cold water and alcohol, its being decomposed, with the evolution

[1] For further details, consult a paper by Messrs. Guynne and Young, *Brit. Ann. of Med.* June 23, and July 14, 1837; also Dr. Ure's *Dict. of Arts*, art. Sugar.

of charcoal, by sulphuric acid, its conversion into oxalic and other acids by nitric acid, its fusing, charring, emitting a remarkable odour (called the odour of caramel), and inflaming by heat, and, lastly, by its not causing, when pure, any precipitate with acetate or diacetate of lead.

Cane sugar is crystallizable, susceptible of vinous fermentation, and has a strongly sweet taste. Its relation to other sugars has already been pointed out. (See vol. i. p. 77.)

Composition.—The following is the ultimate composition of sugar.

	Atoms.	*Eq. Wt.*	*Pr. Ct.*
Carbon	12	72	47·05
Hydrogen	9	9	5·9
Oxygen	9	72	47·05
Anhydrous Sugar	1	153	100·00

	Atoms.	*Eq. Wt.*	*Pr. Ct.*
Anhydrous Sugar	1	153	89·47
Water	2	18	10·53
Crystallized Sugar	1	171	100·00

Dr. Prout (*Phil. Trans.* 1827, p. 355.) regards sugar as a secondary compound of *carbon* and *water*. Dobereiner, (Gmelin, *Handb. d. Chem.* 2, 735,) on the other hand, views crystallized sugar as a *carbonate of hydrocarbon*. Dr. Prout found that while, in the different varieties of sugar, the ratios of carbon to the elements of water varied, yet, that the relative quantity of hydrogen to oxygen was always in the proportion to form water. His statement with regard to the composition of different kinds of sugar has been already noticed (see vol. i. p. 76).

Physiological Effects.—The dietetical qualities of sugar have been already stated (see vol. i. pp. 78, 79). It a generally received opinion that sugar has a tendency to cause flatulency and preternatural acidity of the *primæ viæ*. Occasionally, perhaps, it may do so, but I have never observed it. Though a dyspeptic myself, and obliged to be careful as to diet, I have never experienced any injurious effects from the use of sugar, of which I am remarkably fond. In a medicinal point of view, sugar is to be regarded as a demulcent and emollient.

Uses.—The *dietetical* uses of sugar have been before noticed (see vol. i. p. 78). *Medicinally*, sugar is but little employed. In the form of lozenges, sugar candy, &c., it is slowly dissolved in the mouth to allay tickling cough. As a chemical antidote, it has been recommended in poisoning by the salts of copper, mercury, silver, gold and lead. (Vogel and Buchner, in *Schweigger's Journ.* xiii. 162; xiv. 224.) But any advantage procured by its use, in these cases, is referrible to its demulcent and emollient properties, and not to its chemical influence. The same remark may be made with respect to the benefit said to have been obtained by the use of the juice of the sugar-cane in poisoning by arsenious acid. (Chisholm, *Quart. Journ. of Science*, x. 193.) Powdered white sugar is sometimes sprinkled over ulcers, to remove spongy granulations, denominated proud flesh. The same remedy has also been employed for the removal of specks on the cornea.

In *pharmacy* the uses of sugar are much more extensive. It serves to preserve, to give flavour, bulk, form, colour, cohesiveness, and consistency; to sub-divide and to suspend oily substances in aqueous liquids. To fulfil one or more of these objects, it is a constituent of *syrups*, *elæosacchara*, *conserves*, *electuaries*, *confections*, *lozenges*, some *pills* and *powders*, &c. Its remarkable power of checking the oxidation of some ferruginous compounds has been already noticed.

1. SYRUPUS, L. (U. S.); *Syrupus simplex*, E. D.; *Syrup; Simple Syrup.* (Sugar, lb. x. [℥xxix. D.] (lbiiss., U. S.); Water, Oiij. [Oj. D. U. S.] Dissolve the sugar in the water by a gentle heat.)—It is used to give flavour, cohesiveness, and consistence.

2. LIQUOR SACCHARI TOSTI; *Caramel; Burnt Sugar.*—This is an useful innocuous colouring agent. It is prepared by melting half a pound of brown sugar in an iron pot, and applying heat until the liquid acquires a deep brown colour; then adding a gallon of boiling water.

[1] Peligot, *Ann. de Chim. et de Phys.* lxvii. p. 124.

2. HOR'DEUM DIS'TICHON, *Linn.*, *L. E. D.* (Hordeum, U. S.)—COMMON OR LONG-EARED BARLEY.

Sex. Syst. Triandria, Digynia.

(Semina integumentis nudata, *L.*—Decorticated Seeds, *E.*—Semina decorticata, *D.*)

History.—Pliny, (*Hist. Nat.* xviii. 14,) on the authority of Menander, says, barley was a most ancient aliment of mankind. It was cultivated in Egypt nearly 1500 years before Christ. (*Exodus*, ix. 31.) Hyppocrates mentions three kinds of barley: they were, probably, *H. vulgare*, *H. distichum*, *H. hexastichum*.

Botany. **Gen. Char.**—*Spikelets* three together, the lateral ones usually withered, two flowered, with an upper flower reduced to a subulate rudiment. *Glumes* two, lanceolate-linear, with subulate awns, flattish, unequal sided, at right angles [*contrariæ*] with the paleæ almost unilateral, turned inwards [*anticæ*], herbaceous, rigid. *Paleæ* two, herbaceous; the inferior one (turned inwards), concave, ending in an awn; the superior one (turned outward) contiguous to the rachis, bicarinate. *Stamina* three. *Ovarium* hairy at the apex. *Stigmata* two, sessile, somewhat terminal, feathery. *Scales* two, entire or augmented by a lateral lobe, usually hairy or ciliated, *Caryopsis* hairy at the point, oblong, with a longitudinal furrow internally, adherent to the paleæ, rarely free (*Kunth*). (Fig. 122, 3.)

Sp. Char.—The lateral *florets* male, awnless: the hermaphrodite ones distichous, close-pressed to the stem, awned (*Kunth*).

Hab.—A native of Tartary, cultivated in this country along with three other species; viz, *H. vulgare* (*Spring Barley*), *H. hexastichon* (*Winter Barley*), and *H. Zeocitron* (*Sprat* or *Battledore*).

Fig. 122.

Description.—The grains (*semina hordei cruda*) are too well known to need description. Deprived of their husk by a mill, they form *Scotch*, *hulled*, or *pot barley* (*hordeum mundatum*). When all the integuments of the grains are removed, and the seeds are rounded and polished, they constitute *pearl barley* (*hordeum perlatum*). The farina obtained by grinding pearl barley to powder is called *patent barley*.

Composition.—According to Einhof (Gmelin's *Handb.* ii. 1344.) 100 parts of ripe barley corns consist of *husk* 18·75, *meal* 70·05, *water* 11·20. The same

chemist obtained from 100 parts of barley meal, *fibrous matter* (composed of gluten, starch, and woody fibre) 7·29, *starch* 67·18, *gum* 4·62, *uncrystallizable sugar* 5·21, *gluten* 3·52, *albumen* 1·15, *superphosphate of lime with albumen* 0·24, *water* 9·37, *loss* 1·42. Fourcroy and Vauquelin detected an odorous acrid *oil*, to which the odour of spirit from raw grain has been ascribed: it resides in the integuments of the grains. The *hordein* of Proust is said, by Raspail (*Chim. Org.* ii. 112,) to be nothing but bran more minutely divided than that which remains in the sieve. The grains of barley starch have the same form and appearance as those of wheaten starch; they do not exceed ·00098 of an inch in size.

Chemical Characteristics.—Iodine forms the blue iodide of starch when added to the cold decoction of barley. Decoction of whole barley has an acrid bitter taste, which it derives from the husk.

Physiological Effects.—The husk of barley is slightly acrid and laxative. Deprived of this (as in Scotch and pearl barley) the seeds are highly nutritious (see vol. i. p. 79). The aqueous decoction of Scotch or pearl barley is emollient, demulcent, and easy of digestion.

Uses.—Barley water is employed as a demulcent and emollient drink in febrile disorders, pulmonic inflammation, and irritation of the alimentary canal, whether produced by acrid poisons or other causes.

Administration.—Scotch and pearl barley are used in medicine. Count Rumford (*Essay on Feeding the Poor*, p. 291, 1800,) says, the entire grains of barley may be employed in broth with equal advantage.

1. **DECOCTUM HORDEI**, L. D.; *Aqua hordeata; Barley Water.*—(Barley, [pearl barley], ʒiiss.; Water, Oivss. First wash away, with water, the foreign matters adhering to the barley seeds; then, half a pint of the water being poured on them, boil the seeds a little while. This water being thrown away, pour the remainder of the water, first made hot, on them, and boil down to two pints, and strain, *L.*—The process of the *Dublin Pharmacopœia* is not essentially different).—[The U. S. P. directs barley ʒij. to the same quantity of water].—This is a valuable drink for the invalid in febrile cases and inflammatory disorders, especially of the chest, bowels, and urinary organs. It is usually flavoured with sugar, and frequently with some slices of lemon. It is a constituent of the *Enema Aloes*, L., *Enema Terebinthinæ*, L., and *Decoctum Hordei compositum*, L.

2. **DECOCTUM HORDEI COMPOSITUM**, L. & D.: *Mistura Hordei*, E.; *Decoctum Pectorale; Compound Decoction of Barley; Pectoral Decoction.*—(Decoction of Barley, Oij. [Oiv. *wine measure, D.*]; Figs, sliced, ʒiiss. [ʒij. *D.*]; Liquorice [root] sliced and bruised, ʒv. [ʒss. *D.*]; Raisins [stoned], ʒiiss. [ʒij. *D.* and Water, Oj. *L.*] Boil down to two pints, and strain.—The process of the *Edinburgh* Pharmacopœia is essentially the same.)—This decoction is emollient, demulcent, and slightly aperient. It is employed in the same cases as the simple decoction.

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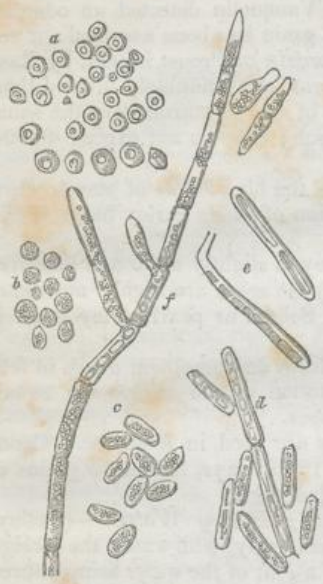
1. Byne; Βύνη; *Maltum; Brasium; Malt.*—This is barley made to germinate by moisture and warmth, and afterwards dried, by which the vitality of the seed is destroyed. When scorched it is called *high-dried malt.* During the process the quantity of sugar in the seed is increased. *Wort* (*Decoctum* seu *Infusum Bynes, Brasii* vel *Malti*) is nutritious, and has been used as an antiscorbutic and tonic. Macbride (*Hist. Account of a new Method of Treat. Scurvy*, 1767,) recommended it in scurvy; (see also a paper by Dr. Badenoch, *Med. Obs. and Inq.* vol. v. p. 61,) but it is apt to increase the diarrhœa. As a tonic it has been used in scrofulous affections, purulent discharges, as from the kidneys, lungs, &c. and in pulmonary consumption. (Rush, *Med. Observ. and Inq.* iv. 367.) The decoction is prepared by boiling three ounces of malt in a quart of water. This quantity may be taken daily.

2. Cerevisia. *Malt Liquor; Beer and Ale.*—A fermented decoction of malt and hops. It is a refreshing and nutritive beverage. Its dietetical and intoxicating properties have been already stated, (see vol. i. 95, 96, 318). For medicinal purposes *Bottled Porter* or *Stout* (*Cerevisia*

Lagenaria) is in general to be preferred. It is used as a restorative in the latter stage of fever, and to support the powers of the system after surgical operations, severe accidents, &c.

FIG. 123.



Torula Cervisiæ Turpin and *Mycoderma Cervisiæ* Desmazières.

3. CEREVISIÆ FERMENTUM, L. D.—*Yeast; Barm; Zumin.* The substance termed yeast from *Must* (*Mustum*) and *Wort* during fermentation, partly as a scum, partly as a sediment. Examined by a microscope it is found to consist of globular, ovoid, or somewhat pyriform transparent vesicles (fig. 123, *a b*). Sometimes they have appeared to me to contain one large granule (as in the mass of vesicles marked *a*), while at other times a number of very small granules are observed in each vesicle as at *b*). These different appearances are probably presented by the vesicles at different stages of their development. Turpin,[1] who spent a night in a brewery that he might examine the changes which these vesicles suffer during the fermentation of beer, states that on each vesicle one or two buds develope, each of which becomes a vesicle which remains attached to the parent one, and in this way rows of two or three adherent vesicles were produced. The vesicles thus described, Turpin regarded as constituting a new plant, which he called *Torula Cervisiæ* (Nat. Ord. *Fungi*, Subd. *Mucedines*).

In the deposit from the Porter refrigerator of Hanbury's brewery I have observed the forms depicted in fig. 123, *c*, *d*, *e*, and *f*. These constitute the plant called by Desmazières, (*Annales des Sciences naturelles*, t. x. p. 42, 1827,) the *Mycoderma Cervisiæ*. Turpin regards these as being produced by the granules of the yeast vesicle placed under favourable circumstances.[2]

As then, it is evident that the vesicles found in yeast are organized beings, it has been suggested that the process of vinous fermentation is the immediate consequence of their vegetation. When placed in a saccharine fluid they are supposed to grow at the expense of the sugar, which is partly converted into alcohol, while the plant gives out carbonic acid. According to this view, therefore, fermentation is the consequence of a vital act. By heat and the action of various poisons, the yeast plant loses its vitality, and with it its power of exciting fermentation.

Considered in a chemical point of view, yeast possesses many of the properties of gluten. Independently of the acids and salts which precipitate with it, it is composed of *Oxygen*, *Hydrogen*, *Carbon*, *Nitrogen*, and *Sulphur*. (Quevenne, *Journ. de Pharm.* t. xxiv. p. 281.)

Yeast has been administered internally as a tonic and antiseptic in typhoid fevers. Dr. Stoker (*On Continued Fever*, p. 121, Dubl. 1829-30,) states, that it usually acts as a mild laxative, improves the condition of the alvine evacuations, and is more effectual in removing petechiæ and black tongue than any other remedy. It is admissible where cinchona and wine cannot be employed, on account of the inflammatory symptoms. The dose of it is two table-spoonfuls every third hour, with an equal quantity of camphor mixture. Enemata of yeast and asafœtida are said, by the same writer, to be efficacious against typhoid tympany. Externally yeast is employed in the form of poultice.

1. CATAPLASMA FERMENTI, L.; *Cataplasma Fermenti Cerevisiæ*, D.; *Yeast Poultice.* (Flour, lbj.; Yeast of Beer, Oss. Mix, and apply a gentle heat until they begin to swell).—It is applied, when cold, to fetid and sloughing sores as an antiseptic and stimulant: it destroys the fetor, often checks the sloughing, and assists the separation of the dead part. It should be renewed twice or thrice a day. I have frequently heard patients complain of the great pain it causes. The carbonic acid is supposed to be the active ingredient.

2. CATAPLASMA FÆCULÆ CERVISIÆ; *Poultice of the Grounds of Beer.*—(Grounds of Stale Beer; Oatmeal; as much of each as may be required to make a poultice).—It is applied cold twice or thrice a day, in the same cases as the preceding preparation, to which its effects are analogous. Sometimes Maltmeal is substituted for Oatmeal (*Cataplasma Bynes*).

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1 *Memoires de l'Academie Royale des Sciences de l'Institute*, t. xvii. p. 112. Paris, 1840.

2 For further details respecting these vesicles I must refer the reader to the works already quoted, as well as to the memoirs of MM. Cagniard Latour and Turpin, of Schwann, Keitzing, and Quevenne, referred to on a former occasion (see vol. i. p. 311, foot note).

3. AVE'NA SATI'VA, *Linn. L. E. D.*—THE COMMON OAT.

Sex. Syst. Triandria, Digynia.

(Semina integumentis nudata, *L.*—Seeds, *E.*—Farina ex seminibus, *D.*)

(Avenæ Farina, U. S.)

HISTORY.—The oat is not mentioned in the Old Testament. Theophrastus, Dioscorides, and Pliny, speak of it.

BOTANY. **Gen. Char.**—*Spikelets* three, many flowered; flowers remote; the upper one withered. *Glumes* two, thin, membranous, awnless. *Paleæ* two, herbaceous; the lower one awned on the back, above the base, at the point almost bicuspidate; the upper one bicarinate, awnless; awn twisted. *Stamina* three. *Ovarium* somewhat pyriform, hairy at the point. *Stigmata* two, sessile, distant, villoso-plumose; with simple hairs. *Scales* two, smooth, usually two-cleft, large. *Caryopsis* long, slightly terete, internally marked by a longitudinal furrow, hairy at the point, covered by the paleæ, adherent to the upper one (?) (*Kunth*).

FIG. 124.

Avena Sativa.

Sp. Char.—*Panicle* equal. *Spikelets* two-flowered. *Florets* smaller than the calyx, naked at the base, alternately awned. *Root* fibrous, annual (*Kunth*).

Hab.—Cultivated in Europe.

Several varieties are cultivated in this country; viz. the *White Oat*, the *Black Oat*, the *Red Oat*, the *Poland Oat*, the *Friezland* or *Dutch Oat*, the *Potatoe Oat*, the *Georgian Oat*, and the *Siberian* or *Tartarian Oat*, (Loudon's *Encyclopædia of Agriculture.*)

DESCRIPTION.—Oats (*semina avenæ cruda*) are too well known to need description. When deprived of their integuments they are called *groats* (*semina integumentis nudata*, L.; *avena excorticata* seu *grutum*): these, when crushed, are denominated *Embden groats*. *Oatmeal farina ex seminibus*, D.) is prepared by grinding the grains. It is not so white as wheaten flour, and has a somewhat bitterish taste.

COMPOSITION.—The grains consist, according to Vogel, of *meal* 66, and *bran* 34. The dried meal is composed of *fixed oil* 2·0, *bitter matter* and *sugar* 8·25, *gum* 2·5, *gray albuminous matter*, 4·3, *starch* 59, *husk* and loss 23·95.

CHEMICAL CHARACTERISTICS.—Iodine forms the blue iodide of starch with the cold decoction of oats.

PHYSIOLOGICAL EFFECTS.—Oatmeal is nutritive, though less so than wheaten flour, (see vol. i. p. 90, for its dietetical properties,) considered medicinally, groats and oatmeal are nutritious, easily digestible, and yield an excellent diet for the invalid.

USES.—In medicine we employ *gruel* prepared from groats or oatmeal, as a mild, nutritious, and easily-digested article of food in fevers and inflammatory affections. In poisoning by acrid substances, it is employed as an emollient and demulcent. It is given after the use of purgatives, to render them more efficient and less injurious. Poultices are sometimes made with oatmeal.

1. DECOCTUM AVENÆ; *Water Gruel.*—This is prepared by boiling an ounce of oatmeal with three quarts of water to a quart, constantly stirring; strain, and when cold decant the clear liquid from the sediment. Sugar, acids, or aromatics, may be employed for flavouring, (Cullen, *op. cit*).

2. PULVIS PRO CATAPLASMATE, D.; *Powder for a Poultice.*—(Linseed, which remains after the expression of the oil, one part; Oatmeal, two parts. Mix.)—This is an unnecessary formula. Moreover it is a bad one; for linseed-meal should be prepared from unpressed flax seed.

3. CATAPLASMA SIMPLEX, D.; *Simple Poultice.* (Made with the above powder and boiling water. The poultice should be smeared over with olive oil).—Used as an emollient application to allay pain and promote suppuration.

4. TRITICUM VULGARE, var. β, HYBERNUM, *Kunth.*—COMMON WHEAT.

Triticum hybernum, *L. D.*—Triticum vulgare, *E.*

Sex. Syst. Triandria, Digynia.

(Farina; farina seminum: Amylum; seminum fœcula, *L.*: Amylum; fecula of the seeds, *E.*: Farina seminum, *D.*)

History.—In the earlier ages it was an esteemed article of food, (*Levit.* ii.) and is frequentley spoken of by Hippocrates, (*De Diæta.*) Pliny, (*Hist. Nat.* xviii. 12,) describes several kinds of it.

Botany. **Gen. Char.**—*Spikelets* three or many flowered: the fructiferous rachis generally articulated, flowers distichous. *Glumes* two, nearly opposite, almost equal, awnless or awned: the upper one bicarinate; the keels more or less aculeato-ciliate. *Stamina* three. *Ovarium* pyriform, hairy at the apex. *Stigmata* two, terminal, subsessile, feathery; with long, simple, finely-toothed hairs. *Scales* two, generally entire and ciliated. *Caryopsis* externally convex, internally concave, and marked by a deep furrow, distinct, or adhering to the paleæ (*Kunth*).

Sp. Char.—*Spike* four-cornered, imbricated; with a tough rachis. *Spikelets* generally four-flowered. *Glumes* ventricose, ovate, truncate, mucronate, compressed below the apex, round, and convex at the back, with a prominent nerve. *Flowers* awned or awnless. *Grains* loose (*Kunth*). (Fig. 122, 2.)

α. *æstivum:* annual; glumes awned.
β. *hybernum:* biennial; glumes almost awnless.

Hab.—It is a native of the country of the Baschkirs, and cultivated in Europe.

Besides the above two varieties, no less than five other kinds of Triticum have been cultivated for their grain. These are T. vulgare, α. æstivum; T. vulgare, β. hybernum; T. turgidum, (compositum); T. turgidum; T. polonicum; T. Spelta; T. monococcum.

Description.—Wheat (*semina tritici*) is reduced by grinding and sifting in mills into *flour* (*farina; seminum farina*, L. D.; *farina tritici*) and bran (*furfur tritici*). The same wheat yields several qualities of flour, distinguished as *firsts*, or *fine flour; seconds;* and *thirds*, or *middlings*.

Composition.—The following are the constituents of several kinds of wheat, (Vauquelin, *Journ. de Pharm.* viii. 353.

	French Wheat.	Odessa Hard Wheat.	Odessa Soft Wheat.	Ditto.	Ditto.	Flour of Paris bakers.	Ditto, of good quality, used in public establishments.	Ditto, inferior kind.
Starch.....	71·49	56·5	62·00	70·84	72·00	72·8	71·2	67·78
Gluten	10·96	14·55	12·00	12·10	7·30	10·2	10·3	9·02
Sugar.....	4·72	8·48	7·50	4.90	5·42	4·2	4·8	4·80
Gum	3·32	4·90	5·80	4·60	3·30	2·8	3·6	4·60
Bran	..	2·30	1·20	..	..	..	..	2·00
Water.....	10·00	12·00	10·00	8·00	12·00	10·0	8·0	12·00
	100·49	98·73	98·56	100·44	100·02	100·0	97·9	100·20

The substance commonly termed *gluten* is a compound of *vegetable albumen*, which is insoluble in alcohol, of *mucin*, soluble in hot alcohol, and of *glutin* or *gliadine*, soluble both in hot and cold alcohol.

Chemical Characteristics.—The cold decoction of wheat-flour forms, with tincture of iodine, the blue iodide of starch. If wheat-flour be made into a paste, with water, and then kneaded under a stream of water until the liquid runs off colourless, the residue in the hand is *gluten*. The water, on standing, deposits *starch;* but retains in solution *gum*, *sugar*, and some phosphatic *salts*.

Nitric acid gives wheat-flour a fine orange-yellow colour. Recently-prepared tincture of guaiacum forms a blue colour with good wheat-flour.

Manufacture of Starch.—Starch is procured by steeping wheat-flour in water for one or two weeks, during which time acetous fermentation takes place. The acid liquor (*sours*) is drawn off, and the impure starch washed on a sieve, to separate the bran. What passes through is received in large vessels, termed *frames*. Here the starch is deposited. The sour liquor is again drawn off, and the *slimes* removed from the surface of the starch, which is to be again washed, strained, and allowed to deposit. When, by these processes, the starch has become sufficiently pure, it is *boxed*, that is, it is placed in wooden boxes, perforated with holes and lined with canvas, where it drains. It is then cut in square lumps, placed on bricks, to absorb the moisture, and dried in a stove. While drying it splits into prismatic pieces, similar to grain tin, or columns of basalt. The greater part of the starch used for stiffening linen (called *Poland* and *glaze starch*) is coloured blue by finely-powdered smalt, or by indigo. This is not adapted for medicinal purposes. *White* (sometimes called *French*) *starch* should be employed. A fine variety of this is termed *patent white starch*.

Starch may also be procured by the action of a solution of a caustic alkali (soda or potash) on wheat-flour or rice meal, by which the gluten is dissolved. (See the specification of Jones's patent in the *Repertory of Patent Inventions*, April, 1841.

Properties of Starch.—Pure wheat starch (*amylum*) is white and almost odourless and tasteless. Examined by the microscope it is found to consist of particles varying considerably in size; the smallest and the largest predominating, the intermediate ones being scarcest. Their shape is for the most part rounded. Their surface is uneven. The hilum is surrounded by concentric rings, but is very indistinct, until a gentle heat is applied to the water in which the particles are placed. Sometimes it is indicated by a round spot or a line: the rings may be traced to the edge of the particle. The particles crack, when heated, at the edges. If the particles be made to roll over in water, they are observed to be oblate spheroids, one of the flattened faces perhaps being somewhat more convex than the other. Viewed edgeways (fig. 125 *a*.) a black line is observed: this perhaps arises from the edge being out of focus.

Fig. 125.

Particles of Wheat Starch.

a. A particle seen edgeways.

Boiled in water, wheat starch yields a *mucilage*, which, when sufficiently concentrated, forms a *jelly* (*hydrate of starch*) in cooking. With iodine the decoction when cold forms the blue iodide of starch, the colour of which is destroyed by alkalis and by heat.

Composition of Starch.—Wheat starch has the following composition;

	Atoms.	*Eq. Wt.*	*Per cent.*	*F. Marcet.*	*Prout.*
Carbon	7	42	43·75	43·7	42·80
Hydrogen	6	6	6·25	6·7	6·35
Oxygen	6	48	50·00	49·7	50·85
Wheat Starch	1	96	100·00	100·1	100·00

Prout's table of the composition of starchy substances has been already given (see vol. i. p. 77).

Physiological Effects.—Wheat surpasses all other cereal grains in its nutritive qualities, in consequence of containing more gluten. It yields the finest, whitest, and most digestible kind of bread. Flour is employed in medicine to form emollient and demulcent preparations.

Wheat-starch, though highly nutritious, is not employed alone as an article of food. Its taste is somewhat disagreeable, and it is more difficult of digestion than other starchy substances.

Uses.—Wheat-flour is rarely used in medicine. It is occasionally sprinkled over burnt or scalded parts, and is a constituent of some poultices, as the Yeast Poultice (p. 58). Mixed with water, so as to form a thin mucilage, it may be employed as a chemical antidote in some cases of poisoning, as by the bichloride of mercury, sulphate of copper, iodine, &c. It is used in Pharmacy for enveloping pills.

Starch powder is used as a dusting powder to absorb acrid secretions and prevent excoriations. It is used as an emollient and demulcent clyster in inflammatory conditions of the large intestines, and as a vehicle for the formation of other more active enemata. It is an antidote for poisoning by iodine, and is sometimes given in combination with this substance to prevent its local action (vide vol. i. p. 233). it enters into the composition of the *Pulvis Tragacanthæ compositus*, Ph. L.

DECOCTUM AMYLI, L.; *Mucilago Amyli; Decoction* or *Mucilage of Starch.* (Starch, 3iv. [3vj. *D.*]; Water, Oj. Rub the starch with the water gradually added, then boil for a short time)—It is sometimes used alone, as an enema in dysentery, irritation of the rectum, &c. It is a constituent of the *Enema Opii* L.

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1. Panis Triticeus. *Wheaten Bread.—Crumb of Bread* (*Mica Panis*) is sometimes used in the formation of pills; but is objectionable for this purpose, on account of the pills thus made becoming excessively hard by keeping. Furthermore, in some cases, the constituents of bread decompose the active ingredients of the pills. Thus the chloride of sodium of bread decomposes the nitrate of silver. Crumb of bread is most valuable for the preparation of poultices. *The Bread and Water Poultice* is prepared by covering some crumb of bread in a basin with hot water: after it has stood for ten minutes, pour off the excess of water, and spread the bread about one-third of an inch thick on soft linen, and apply to the affected part. Sometimes lint dipped in oil is applied beneath the poultice, (Abernethy, *Lancet*, vol. v. 1824, p. 135). Decoction of poppy, or Goulard's water, may be substituted for common water.

This is a valuable application to phlegmonous inflammation. *A Bread and Milk Poultice*, to to which lard is sometimes added, is also used to promote suppuration; but it should be frequently renewed, on account of its tendency to decompose. Both poultices are used in the treatment of irritable ulcers. *Toasted Bread* (*Panis tostus*) is used in the preparation of *Toast-water* (*Infusum Panis tosti*), a mild, agreeable drink in febrile disorders, and in some dyspeptic cases. *Brown* or *Bran Bread* (*Panis furfuraceus*) is used by persons troubled with habitual costiveness, it acts as a slight laxative. It sometimes causes flatulency and acidity. *Biscuit* (*Panis biscoctus*) is used by some dyspeptics as a substitute for fermented bread. *Sea biscuit* (*Panis nauticus*) is preferred by some. (The dietetical properties of bread have been before noticed, see vol. i. pp. 90, 91.)

2. Furfur Tritici. *Bran.*—Decoction or infusion of bran is sometimes employed as an emollient foot-bath. It is also taken internally as a demulcent in catarrhal affections. Its continued use causes a relaxed condition of bowels.

5. SECA'LE CEREA'LE, *Linn.*—COMMON RYE.

Sex. Syst. Triandria, Digynia.

(Semina, *Offic.*)

History.—Rye is mentioned in the Old Testament.

Botany. **Gen. Char.**—*Spikelets* two-flowered. *Florets* sessile, distichous, with the linear rudiment of a third terminal one. *Glumes* two, herbaceous, keeled, nearly opposite, awnless or awned. *Paleæ* two, herbaceous; the lower one awned at the point, keeled, unequal sided, broadest and thickest on the outer side; the upper shorter and bicarinate. *Stamina* three. *Ovarium* pyriform, hairy. *Stigmata* two, nearly sessile, terminal, feathery, with long, simple, finely-toothed hairs. *Scales* two, entire, ciliate. *Caryopsis* hairy at the point, loose (*Kunth*). (See fig. 122, 1; and fig. 126.)

Sp. Char.—*Glumes* and *awns* scabrous (*Kunth*).

Hab.—The Caucasian-Caspian desert. Cultivated in Europe.

Composition.—The grains consist, according to Einhof, of *meal*, 65·6; *husk*,

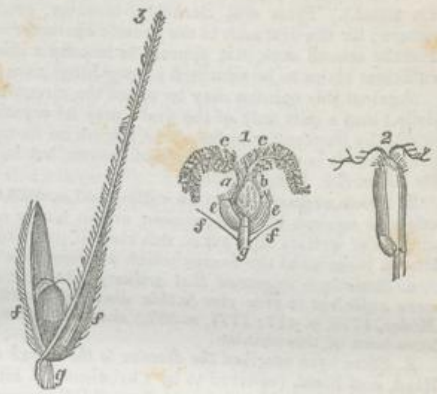
24·2; and *moisture*, 10·2. The meal is composed of *uncrystallizable sugar*, 3·28; *gum*, 11·09; *starch*, 61·07; *husky matter* (woody fibre), 6·38; *gluten*, soluble in alcohol, 9·48; *albumen*, 3·28; *undetermined acid* and loss, 5·62. (Gmelin, *Handb. d. Chemie*, ii. 1343.)

Chemical Characteristics.—A cold decoction of rye forms with iodine the blue iodide of starch.

Physiological Effects.—Rye-flour is nutritive, but less so than wheat-flour. (See vol. i. p. 90.)

Use.—Rye-bread is in common use among the inhabitants of the northern parts of Europe, but in this country is rarely employed. Rye-pottage (*Pulmentum* vel *Jusculum secalinum*) is said to be a useful article of diet in consumptive cases. (Pearson, *Pract. Synop. of the Mat. Alim.* 91.)

Fig. 126.



Secale cereale.

1. *a*. ovarium, with its hairs, *b*; *c*, *c*. the plumose stigmata; *e*, *e*, scales; *f*, *f*, position of paleæ; *g*, receptacle.
2. mature grain, with the embryo at the base and the remains of the stigmata at the top.
3. *f*, *f*, paleæ; *g*, receptacle.

6. SECA'LE CORNU'TUM.—SPURRED RYE OR ERGOT.

(Ergota, *L. E.* (U. S.)

History.—No undoubted reference to ergot is found in the writings of the ancients. The disease produced by it is supposed to be referred to in the following passage:—"1089. A pestilent year, especially in the western parts of Lorraine, where many persons became putrid, in consequence of their inward parts being consumed by St. Anthony's fire. Their limbs were rotten, and became black like coal. They either perished miserably; or, deprived of their putrid hands and feet, were reserved for a more miserable life. Moreover, many cripples were afflicted with contraction of the sinews [*nervorum contractio*]."[1]

The first botanical writer who notices ergot[2] is Lonicerus. (*Kreuterbuch*, p. 885, Franckfort, 1582.) It seems to have been employed by women to promote labour pains long before its powers were known to the profession. Camerarius, (*Actes des Curieux de la Nature*, art. 6, obs. 82, quoted by Velpeau,) in 1683, (Dierbach, *Neuest. Entd. in d. Mat. Med.* 130, 1837,) mentions that it was a popular remedy in Germany for accelerating parturition. In Italy and France also it appears to have been long in use.[3]

Botany.—The nature and formation of ergot are subjects on which botanists have been much divided in opinion.

1. **Some regard ergot as a fungus growing between the glumes of grasses in the place of the ovary.** Otto von Münchausen, (*Hausvater*, i. 332, 1764-1773,) Schrank, (*Baiersche Flora*, ii. 571, 1789,) De Candolle, (*Mém. du Mus. d'Hist. Nat.* ii. 401, 1815,) Fries, (*Syst. Mycol.* ii. 268, 1822,) Wiggers, (*Inq. in Secale Corn.* Götting. 1831, in Christison's *Treatise*,) and Berkeley, (*English Flora*, vi. Part ii. 226, 1836,) have adopted this opinion, and have

[1] Extract from the works of Sigebert, in the *Recueil des Histor. des Gauls et de la France*, tom. xiii. p. 259. A passage somewhat similar to the above, with the addition of the following, "the bread which was eaten at this period was remarkable for its deep violet colour," is quoted by Bayle (*Biblioth. Thérap.* tom iii. p. 374,) from *Mézerai, Abrégé Chronologique*. But I cannot find the passage in the first and best edition of Mezeray's *Abrégé Chron.* 3 vols. 4to. 1668; or in his *Histoire de France*; or in his *Mémoires Hist. et Critiques*. Whether or not it be in the second and less perfect edition of Mezeray's *Abrégé Chronologique*, I am unable to decide, not having seen this work.

[2] The etymology of the word *ergot* is very doubtful. Whiter (*Etymologicon Universale*, ii. 594) thinks that it is derived from *arguo*, and is attached to such terms as *urgeo*. It was anciently written *argot*.

[3] Bayle, *Bibl. Thérap.* iii. 375. Velpeau, in his *Traité Complet de l'Art des Accouchemens*, gives an excellent literary history of ergot.

described ergot as a fungus under the name of *Spermoedia Clavus*, (erroneously quoted in the *Pharm. Lond.* 1836, as *Acinula Clavus*,) Fries (*Clavaria Clavus*, Münch.; *Sclerotium Clavus*, De Cand.). Fries and Berkeley, however, evidently entertain some doubts respecting its nature; for the first adds to the generic character of Spermoedia "*Semina graminum morbosa*," and the second says, "it appears to be only a diseased state of the grain, and has scarcely a sufficient claim to be admitted among fungi as a distinct genus."

Against this opinion may be urged the circumstance noticed by Tessier, (quoted by De Candolle,) that a part only of the grain may be ergotized. Moreover, the scales of the base of the ergot, the frequent remains of the stigma on its top, and the articulation of it to the receptacle, prove that it is not an independent fungus, but an altered grain. (Quekett, in *Proceedings of the Linn. Soc.* Dec. 4, 1838.)

2. **Some regard ergot as a diseased condition of the ovary or seed.** The arguments adduced against the last opinion are in favour of the present one. Though a considerable number of writers have taken this view of the nature of ergot, there has been great discordance among them as to the causes which produced the disease.

α. Some have supposed that ordinary morbific causes, as moisture combined with warmth, were sufficient to give rise to this diseased condition of the grain. Tessier, (*Mém. Soc. Roy. Médec.* 1776, p. 417; 1777, p. 587,) and Wildenow, (in Christison's *Treatise*, p. 829,) appear to have been of this opinion.

β. Some have ascribed the disease to the attack of insects or other animals. Tillet, Fontana, Réad, and Field, (referred to by Christison, *op. cit.* p. 830,) supported this view, which, I may add, has subsequently been satisfactorily disproved.

γ. Some, dissatisfied with the previously assigned causes of the disease, have been content with declaring ergot to be a disease, but without specifying the circumstances which induce it. Mr. Bauer, (MS. *British Museum;* also *Trans. of the Linn. Society*, vol. xviii.) who closely watched the development of ergot during eight years (1805-13), and has made some beautiful drawings of it in different stages, arrived at this conclusion; as also Phœbus. (*Deutschl. kryptogam. Giftegewächse*, Berlin, 1838.)

δ. Others have referred the disease to a parasitic fungus. This opinion, which must not be confounded with that entertained by De Candolle and others (vide *supra*), has been adopted and supported by Léveillé, in 1826, (*Ann. de la Soc. Linn. de Paris,*) by Dutrochet,[1] Smith, (*Trans. Linn. Society*, vol. xviii.) and by Quekett. (*Trans. Linn. Society*, vol. xviii.)

The statements of Léveillé, Phillipar,[2] Smith, and Quekett, leave, I think, but little doubt that ergot is a disease of the grain caused by the presence of a parasitical fungus. This view is supported by the observations of Wiggers—that the white dust (*sporidia*, Quek.) found on the surface of ergot will produce the disease in any plant (grass?) if sprinkled in the soil at its roots. Mr. Quekett (*Op. cit.* p. 104.) has infected grains of corn by immersing them in water in which the sporidia of the *Ergotætia abortifaciens* were contained. The plants which were produced by the germination of the grains were all ergotized. Phœbus, (*Lond. Med. Gaz.* Oct. 8, 1841.) who has most accurately depicted these sporidia, denies that they are spores, on the ground that they are of variable size, and inclose other smaller bodies. But these objections deserve no attention, for, in the first place, by calling these bodies sporidia, we avoid deciding whether they are sporangia or spori; and, secondly, the sporidia of other plants, of the fungic nature of which botanists entertain no doubt, also inclose smaller bodies (*sporidiola*, Berk.) (See *Sepedonium*, in *Eng. Flor.* vol. v. part ii. p. 350.)

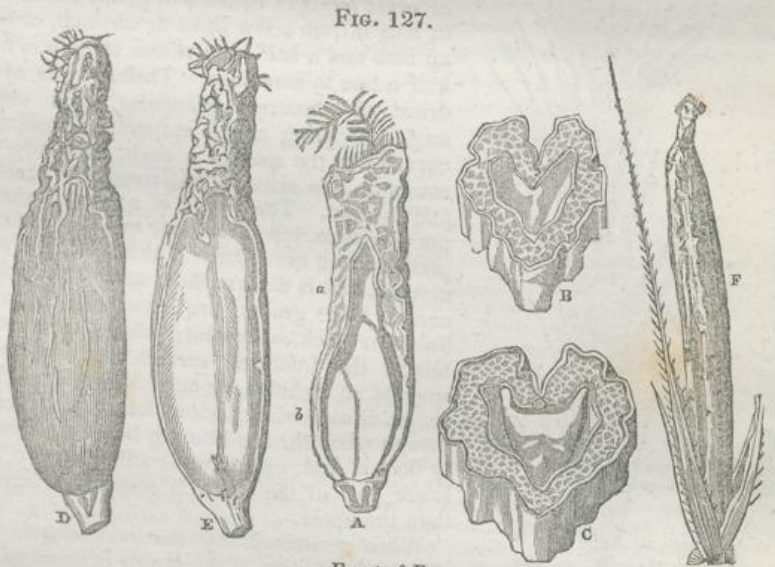
Mr. Quekett, who has most carefully examined the development of ergot, says that the first appearance of the ergot is observed by the young grain and its appendages becoming covered with a white coating, composed of multitudes of sporidia (fig. 112 *a*, p. 45) mixed with minute cobweb-like filaments. (*Ergotætia abortifaciens*, see p. 45, fig. 112 H. I.) This coating extends over all the other parts of the grain, cements the anthers and stigmas together, and gives the whole a mildewed appearance. When the grain is immersed in water, the sporidia fall to the bottom of the liquid. A sweet fluid, at first limpid, afterwards viscid, is found in the affected flower at this stage, and, when examined by the microscope, is found to contain the sporidia just referred to. (Phillipar, Smith, and Quekett.) Phillipar (*Op. cit.* p. 111.) says this fluid oozes from the

[1] *Mémoires pour servir à l'histoire anatomique et physiologique des végét. et des animaux.* vol. ii. p. 161, 1837.
[2] *Traité Organogr. et Phys.-Agr. sur la Carie, le Charbon, l'Ergot,* &c. 8vo. Versailles, 1837.

floral centre; and Mr. Quekett, who at first thought that it had an external origin, is now convinced that it escapes from the ergot or the parts around it.

If we examine the ergot when about half-grown (fig. 127), we find it just beginning to show itself above the paleæ, and presenting a purplish black colour. By this time it has lost in part its white coating, and the production of sporidia and filaments has nearly ceased. At the upper portion of the grain, the coating now presents a vermiform appearance, which Léveillé (Richards, *Elém. d'Hist. Nat.* i. 332.) describes as constituting cerebriform undulations. These are beautifully depicted in Mr. Bauer's drawings (fig. 127, A.D.E.). Léveillé regards this terminal tubercle of the grain as a parisitical fungus, which he calls the *Sphacelia Segetum*. But these undulations are merely masses of sporidia; for if a little be scraped off with a knife, then moistened, and examined by the microscope, we find nothing but myriads of sporidia. The ergot now increases in a very rapid manner.

FIG. 127.



Ergot of Rye.

A. A side view of a longitudinal section of an infected grain, soon after fecundation, when the disease makes its first external appearance: magnified eight times in diameter.
B. Front view of a section of the above infected grain, cut at letter *a*: magnified sixteen times in diameter.
C. Ditto, cut at letter *b*: magnified sixteen times in diameter.
D. Side view of an unripe but advanced ergotized grain, at the upper part of which is the tuberculated portion having a vermiform appearance, and constituting the fungus (*Sphacelia Segetum*) of Léveillé.
E. Longitudinal section of the grain.
F. A full-grown ergot, within its floret, magnified twice in diameter.

The mature ergot (fig. 127, A.) projects considerably beyond the paleæ. It has a violet-black colour, and presents scarcely any filaments and sporidia.

The number of grains in each spike which become ergotized varies considerably: there may be one only, or the spike may be covered with them. (Phillipar, *op. cit.* p. 96.) Usually, the number is from three to ten.

Besides rye, many other grasses (Phœbus has enumerated 31 species) are subject to this alteration, called the spur or ergot. In the summer of 1838 nearly all the grasses growing in Greenwich marshes were found ergotized. Professor Henslow found it in wheat which had been sent to the miller.[1] But the disease is not confined to the *Gramineæ*, the *Cyperaceæ* are also subject to it, and perhaps also *Palmaceæ*. (Phœbus, *op. cit.* 105.)

[1] *Report on the Diseases of Wheat*, p. 20, from the *Journ. of the Royal Agricultural Society of England.*

To the agriculturist, an important subject of inquiry is the predisposing causes of ergot. Very little of a satisfactory nature has, however, been ascertained on this point. One fact, indeed, seems to have been fully established, viz. that moisture, which was formerly thought to be the fertile source of the spur, has little, if any thing, to do with it. (Phillipar, *op. cit.* 126; also, Bauer, MSS.)

Fig. 128.

Secale Cornutum.

Commerce.—Ergot is imported from Germany, France, and America. Mr. Butler, of Covent Garden Market, tells me that about $1\frac{1}{2}$ tons were imported in the year 1839. The duty is five shillings per cwt.

Description of the Ergot.—Spurred rye, or ergot (*ergota*), consists of grains which vary in length from a few lines to an inch, or even an inch and a half, and whose breadth is from half a line to four lines. Their form is cylindrical or obscurely triangular, with obtuse angles, tapering at the extremities (fusiform), curved like the spur of a cock, unequally furrowed on two sides, often irregularly cracked and fissured. The odour of a single grain is not detectible, but of a large quantity is fishy, peculiar, and nauseous. The taste is not very marked, but is disagreeable, and very slightly acrid. The grains are externally purplish brown or black, somewhat glaucous, moderately brittle, the fractured surface being tolerably smooth, and whitish, or purplish white. Their sp. gr. is somewhat greater than that of water, though when thrown into this liquid they usually float at first, owing to the adherent air. The lower part of the grain is sometimes heavier than the upper.

When examined by the microscope, the glaucous condition of the grains is found to depend on the presence of numerous sporidia of the Ergotætia abortifaciens. The violet coat is made up of longitudinally-elongated cells. The tissue of the internal portion of the ergot is composed of the rounded cellular tissue, the cells having the form and regularity of the cells of the normal or healthy albumen, though they are smaller. (Phœbus, p. 101.) In each of these cells are from one to three rounded bodies, which, Mr. Quekett states, are globules of oil, for they are lighter than water, are not made blue by iodine, but are soluble in ether. If the structure of ergot be examined after the grains have been dried and remoistened, the tissue presents a most irregular appearance.

Phœbus (*Op. cit.* p. 104) regards the inner substance of the ergot as the altered albumen, for the embryo does not appear to be formed. The violet coat he considers to be the external (or external and internal) degenerated seed-coat. The little heart-shaped body (*Mützchen*) at the top of the ergot (fig. 127, f.) he regards as the remains of the degenerated and elevated pericarp, together with some other more external parts of fructification, cemented together by the violet-whitish mass (*sporidia*, Quek.) This mass, he observes, is obviously a new formation, originating from the already-described saccharine fluid. But

Mr. Quekett has shown the body, at the top of the ergot, to be the remains of the hairy crown of the grain, of the stigmata, and withered elevated pericarp.

Deterioration.—The ergot of rye is fed on by a little acarus, which is about one-fourth the size of the cheese-mite. This animal destroys the interior of the ergot, and leaves the grain as a mere shell. It produces much powdery excrementitious matter (Quekett). In four months, $7\frac{1}{2}$ ounces of this fæcal matter of the acarus were formed in seven pounds of ergot. I have some ergot which has been kept for four years in a stoppered glass vessel without being attacked by the acarus, and it has all the characteristics of good ergot. It is advisable, however, not to use ergot which has been kept for more than two years.

Composition.—Ergot was analyzed, in 1816, by Vauquelin, (*Ann. Chim.* iii. 337); in 1817, by Pettenkofer, (Buchner's *Repert.* iii. 65); in 1826, by Winkler, (Christison, *On Poisons*, 3d ed. 831); in 1829, by Maas, (Schwartze, *Pharm. Tabell.* 2er Ausg. 460); in 1831, by Wiggers, (Phœbus, *Giftgewächse*, 102); and more recently by Chevallier, (Dierback, *Neue. Entd. in d. Mat. Med.* 1837, p. 129). The results obtained by Chevallier were analogous to those of Wiggers.

Vauquelin's Analysis.

Pale yellow matter, soluble in alcohol, and tasteless like fish-oil.
White bland oil, very abundant.
Violet colouring matter, insoluble in alcohol, soluble in water.
A fixed acid (phosphoric?)
Vegeto-animal or nitrogenous matter, prone to putrefaction, and yielding ammonia and oil by distillation.
Free ammonia, disengaged at 212° F.

Wigger's Analysis.

Ergotin	1·25
Pecular fixed oil	35·00
White crystallizable fat	1·05
Cerin	0·76
Fungin	46·19
Vegetable osmazome	7·76
Peculiar saccharine matter	1·55
Gummy extractive, with red colouring matter	2·33
Albumen	1·46
Superphosphate of potash	4·42
Phosphate of lime, with trace of iron	0·29
Silica	0·14
Ergot	102·20

1. Ergotin was procured by digesting ergot with ether, to romove the fatty matter, and then in boiling alcohol. The alcoholic solution was evaporated, and the extract treated by water. The ergotin remained undissolved. It was brownish red, with an acrid bitter taste, and, when warmed, had a peculiar but unpleasant odour. It was soluble in alcohol, but insoluble in water or ether. It proved fatal to a hen. Nine grains of it were equal to an ounce and a half of ergot. It appears then, that though a poisonous principle, it is probably not the agent which acts on the uterus, for the latter is soluble in water, whereas ergotin is not. It is possible, however, that it may be rendered soluble in water by combination with some other body.

2. Oil of Ergot.—As this is now used in medicine, its properties will be described hereafter (see p. 74.)

There are no good grounds for suspecting the existence of either hydrocyanic acid or phosphate of morphia in ergot, as supposed by Pettenkofer.

Chemical Characteristics.—Ergot is inflammable, burning with a clear yellowish white flame. The aqueous infusion or decoction of ergot is red, and possesses acid properties. Both acetate and diacetate of lead cause precipitates in a decoction of ergot. Iodine gives no indication of the presence of starch. Nitrate of silver causes a copious precipitate soluble in ammonia, but insoluble in nitric acid. Tincture of nutgalls also produces a precipitate (*tannate of ergotin?*) Alkalis heighten the red colour of the decoction.

Physiological Effects.—Great discrepancy is to be found in the accounts published respecting the influence of spurred rye on man and animals. While the majority of experimenters or practical observers concur in assigning to it energetic powers, others have declared it harmless.

α. On Vegetables.—Schubler and Zeller have tried its effects on plants, and I infer from their statements that they found it poisonous, (Marx, *Die Lehre v. d. Giften*, ii. 107.)

β. On Animals.—Accidental observation and direct experiment concur in showing that in most instances spurred rye acts as a poison to the animal econo-

my. But, as Phœbus correctly observes, we cannot call it a *violent* poison, since drachms and even ounces are required to destroy small animals (*e. g.* rabbits and pigeons).

It has proved poisonous to flies, leeches, birds (geese, ducks, pigeons, common fowls, &c.), and mammals (dogs, cats, pigs, sheep, rabbits, &c.) Birds and mammals refuse to take it even mixed with other kinds of food. Diez (quoted by Phœbus, *op. cit.* p. 106,) gives the following as the symptoms produced by it in dogs who are compelled to swallow it:—"Great aversion to the ergot, discharge of saliva and mucus from the mouth, vomiting, dilatation of the pupil, quickened respiration and circulation, frequent moanings, trembling of the body, continual running round, staggering gait, semi-paralysis of the extremities, especially the hinder ones, sometimes diarrhœa; sometimes hot anus, increased formation of gas in the alimentary canal; faintness and sleepiness, with great thirst, but diminished appetite, remained. Death followed under gradually increasing feebleness, without being preceded by convulsions. To the less constant symptoms belong inflammation of the conjunctiva, and the peculiar appearance of turning round in a circle from right to left." Similar observations as to its injurious operation have been made by Robert, (Christison, *op. cit.* p. 832.) In some cases, abscess and gangrene of various parts of the body, with dropping off of the toes, and convulsions, have been noticed. A strong decoction injected into the vein of a dog caused general feebleness, paralysis of the posterior extremities, vomiting, and death. (Gaspard, *Journ. de Phys. exper.* ii. 35.)

But there are not wanting cases apparently showing that spurred rye has no injurious action on animals. The most remarkable and striking are those related by Block, (Phœbus, *op. cit.* p. 107.) In 1811, twenty sheep ate together nine pounds of it daily for four weeks without any ill effects. In another instance, twenty sheep consumed thirteen pounds and a half daily, for two months, without injury. Thirty cows took together twenty-seven pounds daily, for three months, with impunity; and two fat cows took, in addition, nine pounds of ergot daily, with no other obvious effect than that their milk gave a bad caseous cream, which did not yield good butter. These statements furnish another proof to the toxicologist that the ruminants suffer less from vegetable poisons than other animals.

Another interesting topic of inquiry is the action of ergot on the gravid uterus of mammals. Chapman (*Elem. of Therap.* i. 489, 4th ed.) says "it never fails, in a short time, to occasion abortion." We have the testimony of Percy and Laurent, that a decoction injected into the veins of a cow caused the animal to calve speedily; and in one out of three experiments, Mr. Combes has stated, the ergot caused the abortion of a bitch, (Neal, *Researches respecting Spur or Ergot of Rye*, p. 90.) Diez (Phœbus, p. 106,) found that it caused uterine contractions in dogs, rabbits, and sows. Large doses given to bitches induced an inflammatory condition of the uterus, and destroyed both mother and her young. However, in opposition to these statements, we have the evidence of Chatard, Warner, Villeneuve, and others, who failed in producing abortion with it. (Neal, *op. cit.*)

I am indebted to Mr. Youatt, Veterinary Surgeon to the Zoological Society, and Editor of the *Veterinarian*, for the following note respecting the effects of ergot on animals:—

"I have, for the last six or seven years been in the habit of administering the ergot of rye to quadrupeds in cases of difficult or protracted parturition, in order to stimulate the uterus to renewed or increased action. In the *monogastric*, if I may venture to use the term, I have never known it fail of producing considerable effect, even when the uterus had been previously exhausted by continued and violent efforts. In the *ruminant*, with its compound stomach or stomachs, I have witnessed many a case of its successful exhibition. I have had recourse to it in the cow, the sheep, and the deer, both foreign and domestic. Parturition

has not always been accomplished, from false presentation or other causes, but the uterus has in every case responded—it has been roused to a greater or less degree of renewed action. On the other hand, there are cases recorded by veterinary practitioners, in which it has been given in very large quantities without producing the slightest effect. I have always attributed this to a certain degree of forgetfulness of the construction of the stomachs of ruminants. If the medicine, as is too often the case, is poured hastily down, and from a large vessel, it breaks through the floor of the œsophagean canal and falls into the rumen, and there it remains perfectly inert. But if it is suffered to trickle down the œsophagean canal, although a portion of it may still enter the rumen, the greater part will flow on through the œsophagean canal and the manyplies into the fourth or villous stomach, and produce the desired effect."

γ. *On Man.*—These may be noticed under two heads: 1, effects of single doses; 2, effects of its continued use as an article of food.

1. *In single or few doses.*—Hertwig, (Sundelin, *Heilmittell*, i. 513, 3te Aufl.) Lorinser, (*Edin. Med. and Surg. Journ.* xxvi. 453,) Jörg, (*Gebrauch inn. Reizm. z. Beförd d. Geburt.* 1833,) and Diez, (Phœbus, *op. cit.*) who have endeavoured to ascertain the effects of ergot by experiment, agree in stating that, in doses of from half a drachm to two drachms, nausea, inclination to vomit, dryness of the throat, great thirst, aversion to food, uneasiness or actual pain in the abdomen, occasionally alvine evacuations, weight and pain in the head, giddiness, in some cases stupor and dilatation of pupils, have resulted from its use. It deserves, however, to be noticed, that these effects have not been noticed by some experimenters.[1]

The effects produced by the use of single or a few doses of ergot may be conveniently arranged under four heads.

α. *Effects on the uterine system.* (*Uterine contractions.*)—The action of spurred rye on the uterus *when labour has actually commenced*, is usually observed in from ten to twenty minutes after the medicine has been taken, and is manifested by an increase in the violence, the continuance, and the frequency of the pains, which usually never cease until the child is born; nay they often continue for some minutes after, and promote the speedy separation of the placenta and the firm contraction of the uterus in a globular form. The contractions and pains caused by ergot are distinguished from those of natural labour by their continuance; scarcely any interval can be perceived between them, but a sensation is experienced of one continued forcing effort. If from any mechanical impediment (as distortion) the uterus cannot get rid of its contents, the violence of its contraction may cause its rupture, as in the cases alluded to by Dr. Merriman, (*Syn. of Diff. Part.* p. 197, 1838,) Mr. Armstrong, (*Lond. Med. Gaz.* Aug. 4, 1838,) and Mr. Coward.[2]

Ergot sometimes fails to excite uterine contractions. The causes of failure are for the most part conjectural. The quality of the ergot, peculiarities on the part of the mother, and death of the fœtus, have been assigned as such. The two first will be readily admitted; but why the remedy should be altogether inert "where the fœtus has been for some time dead, and putrefaction to any extent taken place" (Dr. Bibby, in Merriman's *Synopsis*, p. 198,) cannot be readily explained. Its occasional failure has been urged by Dr. Hamilton (*Pract. Observ. relating to Midwifery*, part ii. p. 84, 1836,) as an argument in favour of his notion that ergot acts "in no other way than by influencing the imagination." But on the same ground the sialogogue power of mercury might be denied. Dr. Hamilton's erroneous estimate of the powers of ergot is referrible to a want of experience of its use; for he admits that he has only had two opportunities in practice of making a fair trial of it.

[1] Keil, *Diss. inaug. de Secali Cornuto*, Berol. 1822, quoted in Sundelin, *Heilmittell*; also Dr. Chapman, *Elem. of Therap.* vol. i. p. 488, 4th ed.

[2] *Lond. Med. Gaz.* Nov. 27, 1840. Did the ergot cause the rupture, in the case related in the *Lancet*, vol. i. 1836-7, p. 824, by Mr. Hooper?

There is usually much less hemorrhage after delivery, when ergot has been employed, than where it has not been exhibited. The lochial discharges are also said to be less; but this is certainly not constantly the case. Moreover, it has been asserted "that the menstrual discharge has not recurred after the use of the ergot in certain cases of protracted parturition." (Dr. J. W. Francis, in the 3d Amer. ed. of Denman's *Midwifery*, 1829.) But the inference intended to be conveyed here, viz. that ergot caused the non-recurrence, is not correct; at least, I am acquainted with several cases in which this effect did not follow the employment of spurred rye, and I know of none in which it did.

Ergot has been charged with causing the death of the child; but the charge has been repelled by some experienced practitioners as being devoid of the least foundation. "The ergot," says Dr. Hosack, (*Essays*, vol. ii. 296,) "has been called in some of the books, from its effects in hastening labour, the *pulvis ad partum;* as it regards the child, it may with almost equal truth be denominated the *pulvis ad mortem*, for I believe its operation, when sufficient to expel the child, in cases where nature alone is unequal to the task, is to produce so violent a contraction of the womb, and consequent convolution and compression of the uterine vessels, as very much to impede, if not totally to interrupt, the circulation between the mother and child." However, Dr. Chapman (*Elem. of Therap.* i. 488, 4th ed.) strongly denies this charge, and tells us that in 200 cases which occurred in the practice of himself and Drs. Dewees and James, the ergot was used without doing harm in any respect; and he adds, "no one here believes in the alleged deleterious influence of the article on the fœtus." It is not improbable, however, where the impediment to labour is very great, that the violent action of the uterus may be attended with the result stated by Dr. Hosack. Dr. F. H. Ramsbotham (*Lond. Med. Gaz.* vol. xiv. p. 84,) has suggested that the poisonous influence of ergot may be extended from the mother to the fœtus, as in the case of opium. He also states (*Lond. Med. Gaz.* June 15, 1839,) that of 36 cases in which he induced premature labour by puncturing the membranes, 21 children were born alive; while in 26 cases of premature labour induced by ergot only, 12 children only were born alive. This fact strongly favours the notion of the deleterious influence of the ergot on the fœtus.

Given to excite abortion, or premature labour, ergot has sometimes failed to produce the desired effect. Hence many experienced accoucheurs have concluded, that for this medicine to have any effect on the uterus it was necessary that the process of labour should have actually commenced. (Bayle, *Bibl. Phérap.* iii. 550.) But while we admit that it sometimes fails, we have abundant evidence to prove that it frequently succeeds; and most practitioners, I think, are now satisfied that, in a large number of cases, it has the power of originating the process of accouchement. Cases illustrating its power in this respect are referred to by Bayle; (*Op. cit.* p. 550,) and others are mentioned by Waller, (*Lancet*, 1826, vol. x. p. 54,) Holmes, (*Lancet*, 1827-8, vol. ii. p. 794,) Ramsbotham, (*Lond. Med. Gaz.* xiv. pp. 85 & 434; also *Lond. Med. Gaz.* June 15, 1839,) Müller, (Dierbach, *Neuesten Entd. in d. Mat. Med.* i. 139, 1837,) and others,

The action of ergot *on the unimpregnated uterus* is manifested by painful contractions frequently denominated "bearing-down pains," and by the obvious influence which it exercises over various morbid conditions of this viscus; more particularly by its checking uterine hemorrhage, and expelling polypous masses. Tenderness of the uterus, and even actual metritis, are said to have been induced by ergot. (Dr. Negri, *Lond. Med. Gaz.* xiv. 369.)

β. Effects on the Cerebro-Spinal System. (*Narcotism.*)—Weight and pain in the head, giddiness, delirium, dilatation of pupil, and stupor, are the principal symptoms which indicate the action of ergot of rye on the brain. Dr. Maunsell (*Lond. Med. Gaz.* xvi. 606,) has published five cases (viz. two which occurred to Dr. Churchill, one to Dr. Johnson, and two to Dr. Cusack), in which

delirium or stupor resulted from the use of ergot (in half drachm and two drachm doses), and was accompanied by great depression of pulse. (See also Dr. Cusack, in *Dubl. Hosp. Rep.* vol. v. p. 508.) Trousseau and Pidoux (*Traité de Thérap.* i. 546,) found that, under the repeated use of ergot, dilatation of pupil was the most common symptom of cerebral disorder. It began to be obvious in from twelve to twenty-four hours after the commencement of the use of the medicine, and sometimes continued for several days after its cessation. The cerebral disorder is frequently preceded by the uterine contractions, and usually remains for some time after these have subsided.

γ. *Effects of ergot on the circulatory system.*—I have known increased frequency and fulness of pulse, copious perspiration, and flushed countenance, follow the use of ergot during parturition. But in most instances the opposite effect has been induced; the patient has experienced great faintness, the pulse has been greatly diminished in both frequency and fulness, and the face has become pale or livid. In one case, mentioned by Dr. Cusack, (Dr. Maunsell, *Lond. Med. Gaz.* xiv. 606,) the pulse was reduced from 120 to 90. Dr. Maunsell has referred to four other cases. These effects on the circulatory system were accompanied with cerebral disorder, of which they were probably consequences. Similar observations, as to the power of ergot to diminish the frequency of the pulse, have been noticed by others. (Merriman, *Synopsis*, pp. 201 and 203, 1838; Trousseau and Pidoux, *Traité de Thérap.* i. 547.)

δ. *Other effects of ergot.*—Nausea and vomiting are not uncommon consequences of the exhibition of ergot when the stomach is in an irritable condition. Various other symptoms have been ascribed to the use of ergot, such as weariness of the limbs and itching of the skin. (Trousseau and Pidoux, *op. cit.* i. 547).

2. *Effects produced by the continued use of ergot as an article of food* (*Ergotism*, Fr.; *Raphania*, Linn. Vog. Cull. Good; *Convulsio raphania, and Eclampsia typhodes*, Sauv.; *Morbus spasmodicus*, Rothm.; *Morbus convulsivus, malignus, epidemicus, cerealis, &c.* Alt.; *Kriebelkrankheit, or the creeping sickness*, Germ.)—Different parts of the continent, *e. g.* France (especially in the district of Sologne), Silesia, Prussia, Bohemia, Saxony, Denmark, Switzerland, and Sweden, have been, at various periods, visited with a dangerous epidemic (known by the names above mentioned), which affected, at the same time, whole districts of country, attacking persons of both sexes and of all ages. (Tissot, *Phil. Trans.* vol. lv.; Rothman, *Amœn. Acad.* vi. 430.) So long back as 1597 (Tissot) the use of ergotized rye was thought to be the cause of it. Various circumstances have appeared to prove the correctness of this opinion, (*Mém. de la Soc. Roy. de Med.* i. 1777,) which has been further confirmed by the effects of ergot on animals, as well as by the occurrence of a disease similar to, if not identical with, ergotism, in consequence of the use of damaged wheat. (*Phil. Trans.* for 1762; Henslow, *op. supra cit.*) Yet several intelligent writers have not acquiesced in this view; and the circumstances mentioned by Trousseau, (*Traité de Thérap.* i. 527,) and by Dr. Hamilton, (*Practical observations relative to Midwifery*, pt. ii. p. 85,) are certainly calculated to throw some doubts over the usually-received opinion.

Ergotism assumes two types, the one of which has been denominated the *convulsive*, the other the *gangrenous ergotism*. Whether these arise from different conditions of the ergot, or from peculiarities on the part of the patient, or from the different quantity of the ergot taken, we are hardly prepared now to say. In *convulsive ergotism* the symptoms are, weariness, giddiness, contraction of the muscles of the extremities, formication, dimness of sight, loss of sensibility, voracious appetite, yellow countenance, and convulsions, followed by death. In the *gangrenous ergotism* there is also experienced formication; that is, a feeling as if insects were creeping over the skin, voracious appetite, coldness, and insensibility of the extremities, followed by gangrene. (Christison, *Treat. on Poisons*, 3d ed. p. 833; Orfila, *Toxicol Gén.*)

Uses.—To Dr. Stearns, of the United States, is due the credit of introducing ergot of rye to the notice of the profession as an agent specifically exciting uterine contractions. (*New York Med. Repos.* vol. xi. 1807, quoted in the *United States Dispensatory.*) In 1814 a paper was published by Mr. Prescot, (*Med. and Phys. Journ.* vol. xxxii. p. 90, 1815,) on the effects of it in exciting labour-pains, and in uterine hemorrhage. It was not employed in England until 1824. The following are the principal uses of it:

1. *To increase the expulsatory efforts of the womb in protracted or lingering labours.*—When the delay of delivery is ascribable solely to the feeble contractions of the uterus, ergot is admissible, provided, first, that there be a proper conformation of the pelvis and soft parts; secondly, that the os uteri, vagina, and os externum, be dilated, or readily dilatable, and lubricated with a sufficient secretion; and, lastly, that the child be presenting naturally, or so that it shall form no great mechanical impediment to delivery. A natural position of the head is not an absolute essential for the use of ergot, since this medicine is admissible in some cases of breech presentation. (Dr. F. H. Ramsbotham, *Lond. Med. Gaz.* xiv. 86.) The circumstances which especially contra-indicate or preclude the use of this medicine are those which create an unusual resistance to the passage of the child: such are, disproportion between the size of the head and of the pelvis, great rigidity of the soft parts, and extraneous growths. Moreover, "earliness of the stage" of labour is laid down by Dr. Bigelow, (*Quart. Journ. of Literature, Science, and Arts*, ii. 53,) as a circumstance contra-indicating the use of ergot. The proper period for its exhibition is when the head of the child has passed the brim of the pelvis. Some practitioners assert that a dilated or lax condition of the os uteri is not an essential requisite for the exhibition of ergot. It has been contended that one of the valuable properties of this medicine is to cause the dilatation of the uterine orifice, and cases are not wanting to confirm these statements. (Bayle, *op. cit.* p. 539.)

2. *To hasten delivery when the life of the patient is endangered by some alarming symptom.*—Thus, in serious hemorrhages occurring during labour, after the rupture of the membranes, and where the placenta is not situated over the os uteri, the ergot is especially indicated.[1] It has also been employed to accelerate delivery in puerperal convulsions. Five successful cases of its use are recorded by Bayle, (*Bibl. Thérap.* iii. 448 and 548,) on the authority of Waterhouse, Mitchell, Roche, Brinkle, and Godquin. But the narcotic operation of ergot presents a serious objection to its use in cerebral affections.

3. *To provoke the expulsion of the placenta when its retention depends on a want of contraction of the uterus.*—In such cases ergot has often proved of great advantage.[2] When the hemorrhage is excessive the ergot must not be regarded as a substitute for manual extraction, since, during the time required for its operation, the patient may die from loss of blood. (Dr. F. H. Ramsbotham, *Lond. Med. Gaz.* xiv. 738.) In retention of the placenta from spasmodic or irregular contraction of the uterus, as well as from morbid adhesion, ergot is improper or useless. (Dr. Jackson, *Lond. Med Gaz.* iv. 105.)

4. *To provoke the expulsion of sanguineous clots, hydatids, and polypi from the uterus.*—Coagula of blood collected within the womb after delivery may sometimes require the use of ergot to excite the uterus to expel them, as in the case mentioned by Mackenzie. (Neal, *Researches*, p. 88.) Ergot is also valuable in promoting the expulsion of those remarkable formations called uterine hydatids, (*Acephalocystis racemosa*, H. Cloq,) and which are distinguished from the acephalocysts of other parts of the body by their not possessing an independent life, so that when separated from their pedicles they die. (Cruveilhier,

[1] Dr. Blundell, *Lancet* for 1827-8, vol. i. p. 805; Dr. F. H. Ramsbotham, *Lond. Med. Gaz.* vol. xvi. pp. 86 and 692.

[2] Dr. Blundell, *Lancet*, 1827-8, vol. ii. p. 259; Bayle (*Bibl. Therap.* vol. iii. 541), has recorded nine cases, from Balardini, Bordol, Davies, Duchâteau, and Morgan; and many others will be found in the medical journals.

Dict. de Méd. et de Chir. prat. art. Acéphalocystes, p. 260.) A successful case of the use of ergot in this affection has been published by Dr. Macgill. (Bayle, *op. cit.* p. 471.) In uterine polypus, ergot has been exhibited with the view of hastening the descent of the tumour from the uterus into the vagina, so as to render it readily accessible for mechanical extirpation (Dr. H. Davies, *Lond. Med. and Phys. Journ.* vol. liv. p. 102, 1825); for it is well known, that until this is effected, the patient is continually subject to hemorrhage, which, in some cases, proves fatal. In some instances ergot has caused the expulsion of a polypus. (*Lancet*, 1828-9, vol. i. p. 24.)

5. *To restrain uterine hemorrhage, whether puerperal or non-puerperal.*—Ergot checks hemorrhage from the womb, principally, if not solely, by exciting contraction of the muscular fibres of this viscus, by which its blood-vessels are compressed and emptied, and their orifices closed. The experience of physicians and surgeons in all parts of the civilized world has fully and incontestibly established the efficacy of ergot as a remedy for uterine hemorrhage. (See the list of cases in Bayle's *Bibl. Thérap.* iii. 543.) Maisonneuve and Trousseau, (*Bull. de Thérap.* t. iv.; also, Trousseau and Pidoux, *Traité de Thérap.* i. 540.) have shown that the beneficial influence of ergot is exerted equally in the unimpregnated as in the impregnated state; proving, therefore, that the contrary statement of Prescott and Villeneuve is incorrect. Even in a case of cancer of the uterus they have found it check the sanguineous discharge. In females subject to profuse uterine hemorrhages after delivery, ergot may be administered as a preventive, just before the birth of the child. (Roche, *Dict. de Méd. et Chir. prat.* art. Ergot, p. 455.) Even in placenta presentations, a dose or two of ergot may be administered previously to the delivery being undertaken. (Dr. F. H. Ramsbotham, *Lond. Med. Gaz.* xiv. 660.) To restrain excessive discharge of the lochia or catamenia, this remedy is sometimes most beneficial.

6. *To provoke abortion, and to promote it when this process has commenced and is accompanied with hemorrhage.*—Under certain circumstances the practitioner finds it expedient to produce the abortion: as in serious hemorrhage during pregnancy, and in deformed pelves which do not admit the passage of a full-grown fœtus. In such cases the ergot may be employed with great advantage, (*Lond. Med. Gaz.* xiv. p. 434; also, Dr. Weihe, in *op. cit.* vol. xviii. 543). When abortion has already commenced, ergot may be employed to quicken the process and check hemorrhage.

7. *In leucorrhœa and gonorrhœa.*—Ergot was first given in leucorrhœa by Dr. M. Hall, (*Lond. Med. and Phys. Journ.* May 1829); and was subsequently employed by Dr. Spajrani, (*Lancet*, Feb. 5th, 1831,) with success; and in eight cases by Dr. Bazzoni, (*Bayle*, p. 509,) seven of these were cured by it. Dr Negri, (*Lond. Med. Gaz.* xiii. p. 369,) published seven successful cases of its use. Its efficacy has been confirmed by many other practitioners. Dr. Negri also used it with apparent benefit in gonorrhœa, in both the male and female. He concludes that "secale cornutum has a peculiar action on the mucous membranes; but if exhibited when there is a state of acute inflammation, their morbid secretions may be considerably increased; on the contrary, when a more chronic form of inflammation does exist, the secale cornutum may have a beneficial influence in arresting their preternatural discharge."

8. *In hemorrhages generally.*—The power possessed by ergot of exciting uterine contractions, readily explains the efficacy of this agent in restraining sanguineous discharges from the womb; but we can in no way understand how hemorrhage from other organs can be influenced by it. We are not, however, to deny the therapeutic power of a medicine merely because we cannot explain its *modus medendi*, though we are justified in requiring abundant proofs ere we admit it. It must be acknowledged, that a considerable number of cases have been published in proof of the power possessed by ergot of checking hemor-

rhages from other organs (as the nose, gums, chest, stomach, and rectum) than the uterus.[1] But having found it unsuccessful in my own practice, seeing that in the hands of others it has also failed, (Trousseau and Pidoux, *Traité de Thérap.* i. 546,) and knowing how difficult it is to ascertain the influence of remedies on hemorrhages, I think further evidence is required to prove the anti-hemorrhagic powers of ergot.

9. *In amenorrhœa.*—Some few cases have been published tending to show that ergot possesses emmenagogue properties, (Neal, *Researches*, p. 79). It appears to me to be more calculated to cause than to relieve amenorrhœa.

10. *In other diseases.*—Ergot has been employed in various other diseases with apparent success; viz. intermittent fever, (Dierbach, *op. cit.* p. 444,) paraplegia, &c., (Bayle, *op. cit.* p. 548).

Administration.—Ergot is usually given in the form either of powder or infusion. The decoction, less frequently the tincture, and still more rarely the extract, are also used. Latterly the etherial oily extract and oil have been used.

1. PULVIS SECALIS CORNUTI. *Pulvis Ergotæ.*—This powder is only to be prepared when required for use. The dose of it, for a woman in labour, is twenty grains; to be repeated at intervals of half an hour for three times; for other occasions (as leucorrhœa, hemorrhages, &c.) five to ten or fifteeen grains, three times a day: its use should not be continued for any great length of time. It may be taken mixed with powdered sugar. It has had the various names of *pulvis parturiens* (more correctly *parturifaciens*), *pulvis ad partum*, *pulvis partum accelerans*, *obstetrical powder*, *&c.*

2. INFUSUM SECALIS CORNUTI. *Infusum Ergotæ.*—Ergot, bruised, ʒj.; boiling water, fʒiv.; macerate until cold, in a slightly covered vessel, and strain. The dose, for a woman in labour, is one-third or one half of this, to be repeated, at intervals of half an hour, until the whole be taken. Sugar, aromatics (as nutmeg or cinnamon), or a little wine or brandy, may be added to flavour it.

3. DECOCTUM SECALIS CORNUTI. *Decoctum Ergotæ.*—Ergot, bruised, ʒj.; water, ʒvj. Boil for ten minutes in a lightly covered vessel, and strain. The dose is one-third of the strained liquor, to be repeated, at intervals of half an hour, until the whole be taken.

4. TINCTURA SECALIS CORNUTI. *Tinctura Ergotæ.*—Ergot, bruised, ʒss.; rectified spirit, ʒvj.; digest for four days, and strain. The dose, in lingering labours, is a teaspoonful. This is the formula of Dr. Robert, (Dierbach, *Neuesten Entd. in d. Mat. Med.* i. 147, 1838). A tincture is recommended by Carus, (*Lehrb. d. Gwynacologie*, i. 280, 1827). At Apothecaries' Hall, London, *tincture of ergot* is prepared by digesting ergot, ʒij. in proof spirit, Oj. Another formula has been published, (*Lancet*, 1827-8, vol. ii. p. 435):—Ergot, bruised, ʒj.; boiling water, ʒij. Infuse for twenty-four hours, and add rectified spirit, ʒiss. Digest for ten days. Half a drachm of this tincture is said to be equivalent to ten grains of the powder. One or two spoonsful of a tincture of ergot (prepared by digesting ʒss of ergot in ʒiv. of rectified spirit) mixed with water, has been recommended as an injection into the uterus in difficult labour. It is to be introduced between the head of the child and the neck of the uterus, (*Berlinisches Jahrbuch.* Bd. xxxviii. 234, 1837).

5. OLEUM ERGOTÆ; *Oil of Ergot.*—The liquid sold in the shops under the name of *pure oil of ergot* is obtained by submitting the etherial tincture of ergot (which is procured by percolation, see vol. i. p. 326), to evaporation by a very gentle heat. Its colour is reddish brown. Mr. Wright (*Ed. Med. and Surg. Journal*, vol. liv. p. 52,) states that this depends on the age of the ergot, and that when obtained from recent specimens it is not unfrequently entirely free from colour. Its taste is oily and slightly acrid. It is lighter than water, and is soluble in alcohol and in solutions of the caustic alkalis. It is probably a mixture of several proximate

[1] See the cases of Drs. Spajrani, Pignacco, and Gabini, in the *Lancet* for 1830 and 1831; and of Dr. Negri, in the *Lond. Med. Gaz.* xiii. 361.

principles. I made a guinea-pig swallow a fluidrachm of it: the only obvious effect was copious and frequent diuresis. Two fluidrachms diffused through water and injected into the jugular vein of a dog, caused trembling of the muscles, paralysis of the hind, and great weakness of the fore, legs, which lasted for more than two days. The respiration and action of the heart were exceedingly rapid. The saliva streamed copiously from the mouth. The pupil was strongly dilated before the experiment, and no obvious change in it was induced by the oil. Mr. Wright found the oil very energetic. A drachm, he states, injected into the jugular vain caused dilatation of the pupil, feeble, slow, and intermittent action of the heart, deep and interrupted respiration, general paralysis, insensibility to punctures, and death in two hours and forty minutes.

According to evidence adduced by Mr. Wright the oil possesses the same influence over the uterus as that of the crude drug; that is, it occasions powerful uterine contractions. To produce this effect it should be given in doses of from 20 to 50 drops in any convenient vehicle, as cold water, warm tea, or weak spirit and water.

The *essential solution of ergot* used by Mr. Lever (*Lond. Med. Gaz.* N. S. vol. ii. for 1839–40) to promote uterine contraction, is essentially a solution of the oil of ergot. It was prepared by digesting ʒiv. of powdered ergot in fʒiv. of ether during seven days. The tincture was submitted to spontaneous evaporation, and the residue dissolved in fʒij. of ether. The dose of this solution is from ♏xv. to ♏xxx. on a lump of sugar.

Antidote.—The proper treatment to be adopted in a case of poisoning by an overdose of ergot has not been accurately determined. The first object would be, of course, to evacuate the poison from the alimentary canal by the use of emetics or purgatives. As chlorine decomposes ergotin, Phœbus recommends the employment of chlorine water. In the absence of this, nitrohydrochloric acid (properly diluted) might be exhibited. The subsequent treatment should be conducted on general principles.

OTHER DIETETICAL OR MEDICINAL CEREALIA.

1. Rice (*Oryza sativa*, fig. 129) is the ordinary sustenance of many oriental nations. Being less laxative than the other cereal grains, it is frequently prescribed by medical men as a light,

Fig. 129. Fig. 130. Fig. 131.

Oryza sativa. *Panicum miliaceum.* *Zea Mays.*

digestible, uninjurious article of food in diarrhœa and dysentery; and in consequence it is, with the public, a reputed drying and astringent agent. Various ill effects, such as disordered vision, &c. have been ascribed to the use of rice;[1] but without any just grounds. Neither does there appear to be any real foundation for the assertions of Dr. Tytler (*Lancet*, 1833-4, vol. i.), that malignant cholera (which he calls *morbus oryzeus!*) is induced by it.

2. Common Millet (*Panicum miliaceum*, fig. 130,) and Italian Millet (*Setaria Italica*), are cultivated in Italy as articles of food.

3. Maize or Indian Corn (*Zea Mays*, fig. 131) is nutritive; but being deficient in gluten, is not adapted for manufacture into bread. It is apt to occasion diarrhœa in those unaccustomed to it. (Dunglison, *Elem. of Hygiène*, p. 289.) In America, Asia, and some parts of Europe, it is used largely for human sustenance.[2]

Order VIII.—ACORACEÆ, *Lindl.*—THE SWEET FLAG TRIBE.

Acoroideæ, *Agardh, Schott.*

Essential Character.—*Flowers* hermaphrodite, surrounded with scales. *Spathe* leafless, not rolled up. *Stamens* complete, opposite the scales, with two-celled anthers turned inwards. *Ovaries* distinct. *Fruit* baccate, finally juiceless. *Seeds* albuminous, with the embryo in the axis.—*Rhizome* jointed. *Leaves* ensiform, embracing each other in the bud (*Schott*).
Properties.—Acorus Calamus is the only plant of the family whose properties are known.

AC'ORUS CAL'AMUS, *Linn. L. E.* (U. S.)—COMMON SWEET FLAG.

Sex. Syst Hexandria, Monogynia.

(Rhizoma, *L.*—Rhizome, *E.*)

History.—This is probably the ἄκορον of Dioscorides. (Lib. i. cap. 2.) Dr. Royle says that in Persian works *akoron* is given as its Greek appellation. It must not be confounded with the κάλαμος ἀρωματικὸς of Dioscorides, which, according to Dr. Royle, (*Essay on the Antiq. of Hindoo Med.* p. 33,) is *Andropogon Calamus aromaticus*. Royle (vide p. 52).

Botany.—**Gen. Char.**—*Flowers* arranged upon a *spadix*. *Spatha* none. *Perianth* of six pieces or scales, inferior. *Stigma* sessile. *Capsule* indehiscent. (*Hooker.*)

Sp. Char.—Anticipate [two-edged] *scape* rising much above the spadix. (*Hooker.*)

Rhizome thick, rather spongy, with many long roots, aromatic, like every part of the herbage, but much more powerfully so. *Leaves* erect, two or three feet high, bright green, near an inch broad. *Stalk* like the leaves, except being thicker below the *spadix*, and not quite so tall. *Spadix* about a foot above the root, a little spreading, two or three inches long, tapering, covered with a mass of very numerous, thick-set, pale-green *flowers*, which have no scent, except when bruised. A very narrow wavy membrane may be observed at the base of the spadix, which, perhaps, ought to be taken into the generic character as a *spathe* (*Smith*).—Perennial: flowers in June.

Hab.—It is a native of this country, growing in watery places about the banks of rivers, and is very plentiful in the rivers of Norfolk, whence the London market is supplied. It grows also in other countries of Europe, in Asia, and in the United States.

Description.—The dried underground stem (*rhizoma*, L.; *radix acori veri* seu *radix calami aromatici*, Offic.) occurs in the shops in flattened pieces four or five inches long, and about as broad as the thumb; jointed, somewhat curved, of a spongy or corky texture internally; of a yellowish brown or fawn colour externally, and buffy, with a slight roseate hue, internally. Their fracture is short: their upper surface is marked transversely with the vestiges of the leaves

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1 Bontius, *Account of the Diseases, Nat. Hist. &c. of the East. Ind.* translated into English, p. 126, 1769; and Bricheteau, in Tortuelle's *Elem. d'Hygiène*, 4me éd.

2 For further information respecting Maize, consult Cobbett's *Treat. on Cobbett's Corn; Quart. Journ. Agric.* i.; and *Mém. de l'Acad. Roy. de Med.* t. ii. p. 206. Paris, 1833.

which were attached to it; the lower surface has numerous dark points, surrounded by small light-coloured elevated circles, from which the roots arise. Their taste is warm and bitter; their odour is aromatic. In Germany, the rhizome is usually peeled before drying it (*rhizoma decorticata*); but the operation is unnecessary and wasteful. In this state the rhizome is grayish white and easily pulverizable.

The rhizome should be gathered in spring or late in the autumn, and dried quickly.

The rhizome of the Yellow Water Iris (*Iris Pseudo-acorus*) is said to be sometimes substituted for that of the true Acorus.

Composition.—The fresh rhizome was analysed by Trommsdorf, (Gmelin, *Handb. d. Chem.* ii. 1339), who obtained the following results:—*Volatile oil*, 0·1; *soft resin*, 2·3; *extractive, with a little chloride of potassium*, 3·3; *gum, with some phosphate of potash*, 5·5; *starchy matter* (like inulin), 1·6; *woody fibre*, 21·5; and *water*, 65·7. Meissner found traces of copper in the ashes.

The active constituents are the oil, the resin, and the extractive.

Oil of the common sweet flag (called in the shops *oleum calami aromatici*) is obtained by distilling the fresh rhizome with water. Its odour is similar to, though less agreeable than, that of the rhizome. Its colour is yellow. It is bought by snuff-makers, so that it is used, I presume, for scenting snuff. It is also employed in the preparation of *aromatic vinegar* (see vol. i. p. 355.)

Chemical Characteristics.—Iodine blackens the rhizome (especially when it has been boiled), thereby indicating the presence of starch. The cold decoction of the rhizome forms, with a solution of iodine, the blue *iodide of starch*. Acetate and diacetate of lead, and protonitrate of mercury, cause precipitates with the decoction. These precipitates consist principally of metallic oxides or subsalts and the substance called extractive. Nitrate of silver produces a precipitate (*chloride of silver*), which is insoluble in nitric acid, but soluble in ammonia. The decoction reddens litmus.

Physiological Effects.—It is an aromatic stimulant and mild tonic. Vogt (*Lehrb. d. Pharmakodyn*, i. 454, 2te Aufl.) arranges it with the *excitantia volatilia*, and regards it as approaching angelica root on the one hand, and cascarilla and angustura barks on the other.

Uses.—It is rarely employed by medical practitioners, though it might be frequently substituted, with good effect, for the more costly oriental aromatics. It is a useful adjunct to other stimulants and tonics. It has been employed in continued asthenic fevers accompanied with much prostration of strength and greatly weakened digestive power. For the cure of ague, the dried root powdered is used by the country people in Norfolk. (Sir J. E. Smith, *Engl. Flora*, ii. 158.) It is well adapted for dyspeptic cases accompanied with, or dependent on, an atonic condition of the digestive organs, and is especially serviceable in gouty subjects. It has also been used as a local agent, viz. in the formation of aromatic baths, poultices, and gargles, as an application to foul-conditioned ulcers, &c.

Administration.—In *powder*, the rhizome may be given in doses of from a scruple to a drachm. The *infusion* is perhaps the most eligible preparation: it is made by digesting ʒj. of the rhizome in ʒxij. of boiling water; the dose is two or three tablespoonsful. The *decoction* is an objectionable preparation, as the oil of the rhizome is dissipated by boiling. The *tincture* (Ph. Bor.) is procured by digesting ʒij. of the rhizome in ʒxij. of spirit (sp. gr. 0·900); the dose is a teaspoonful.