4. UNGUENTUM CERÆ FLAVÆ, D. *Ointment of Yellow Wax.* (As the preceding, except that Yellow Wax is substituted for White Wax).—Effects and uses as the last.

5. LINIMENTUM SIMPLEX, E. *Simple Liniment.* (Olive Oil, *four parts;* White Wax, *one part.* Dissolve the wax in the oil with a gentle heat; and agitate well as the fused mass cools and concretes.)—Differs from the Unguentum simplex in its greater liquidity. Used to soften the skin, and to promote the healings of chaps, &c.

OTHER HYMENOPTEROUS INSECTS.

The tribe of hymenopterous insects, called *Gallicolæ* or *Diploleparіæ*, contains the insects which produce those excrescences on plants commonly denominated *galls* (see *Nutgall*, p. 190, and *Bedeguar*, p. 552). Latreille (in Cuvier's *Règne Animal*, t. v. p. 291, 1829), comprehends all the insects of this tribe in one genus,—viz. *Cynips*.

Class VII.—CRUSTACEÆ, *Cuvier.*—CRUSTACEANS.

The dietetical properties of the Crustaceans (Lobsters, Crabs, Cray-fish, Prawns, and Shrimps), have been already noticed (see vol. i. p. 88).

1. Astacus fluviatilis.—In the stomach of the *Crawfish* are found, at the time the animal is about to change its shell, two calcareous concretions, commonly called *Crab's Eyes* or *Crab's Stones* (*Lapilli Cancrorum*), which were formerly ground and employed in medicine, as absorbents and antacids, under the name of *Prepared Crab's Stones* (*Lapilli Cancrorum præparati; Lapides Cancrorum præparati; Oculi Cancrorum præparati*). They consist of carbonate of lime and animal matter principally, with a little phosphate of lime. Their use is now obsolete. In the shops, imitations of them (prepared with chalk and mucilage, or size) are still met with.

2. Cancer pagurus.—The *Black-clawed or Large Edible Crab* was at one time an officinal animal. Its *Claws* (*Chelæ Cancrorum*) when prepared by grinding, constitute the *Prepared Crab's Claws* (*Chelæ Cancrorum præparatæ*) of the shops. Their composition and uses are similar to those of prepared Crab's stones. For an account of the effects and uses of carbonate of lime, see vol. i. p. 503.

Division II. Vertebrata.—Vertebral Animals.

Essential Characters.—Animals furnished with a *skull* and *vertebral column* for the protection of the brain and spinal marrow.

Class VIII. *PISCES*—*FISHES.*

Essential Characters.—*Vertebrated* animals with cold red *blood*, respiring by *gills* or *branchiæ*, and moving in the water by the aid of *fins*.

No article of the Materia Medica, contained in the British pharmacopœias, is derived from this class of animals; but the important uses of *Isinglass*, and the extraordinary efficacy, in various diseases, ascribed by some writers to *Cod's Liver Oil*, render it necessary to notice both of these productions.

1. ICHTHYOCOL'LA, (U. S.)—ISINGLASS.

History.—Ichthyocolla (ἰχθυοκόλλα, from ἰχθύς, *a fish*, and κόλλα, *glue*) is mentioned by both Dioscorides (lib. iii. cap. 102) and Pliny. (*Hist. Nat.* lib. vii. cap. 57; and lib. xxxii. cap. 24, ed. Valp.) The latter of these writers ascribes its invention to Dædalus.

Zoology.—Isinglass is obtained from various fishes, some only of which have hitherto been ascertained. The finest kinds are procured from different species of *Acipenser*. Several other genera,—as *Silurus*, *Morrhua*, *Gadus*, *Otolithus*, *Lota*, and *Polynemus*, also yield it.

The organ from which isinglass is usually procured, is the *air-bag*, or *swimming-bladder*, sometimes termed the *sound*. It is a membranous sac filled with air (containing from 69 to 87 per cent. of oxygen), and placed under the spine,

in the middle of the back, and above the centre of gravity. In most fish it communicates with the œsophagus, or stomach, by the *ductus pneumaticus*. In others it is an imperforate sac. Occasionally there are two sacs, which communicate with each other. In the Acipenser stellatus, according to Brandt, (Brandt and Ratzeburg's *Medicinische Zoologie*, p. 27, Berlin, 1833,) the bag is composed of three membranes: an external, silvery one, derived from the peritoneum; a middle, membranous (*hautigen*) one; and the most internal, very vascular, and, as it were, pulpy membrane. The latter, he states, yields the fish gelatine. But unless the sound of this fish differs considerably from that of other fishes, there must be an error in this statement. I have examined all the purse and pipe isinglasses of commerce, and find the internal to be an insoluble membrane. In the cod the innermost membrane is very thin, and is perhaps analogous to the epithelium. External to this is a highly vascular thin coat, and still more external is the gelatinous coat, which appears devoid, or nearly so, of vessels.

Preparation.—The mode of preparing the swimming bladder for sale as isinglass, varies in different countries. Sometimes the bag is dried unopened, as in the case of the *purse*, *pipe*, and *lump* isinglass of the shops. At other times it is laid open, and submitted to some preparation; being either dried unfolded, as in the *leaf* and *honeycomb* isinglass; or folded, as in the *staple* and *book* isinglass; or rolled out, as in the *ribbon* isinglass. When it arrives in this country it is *picked* or *cut*. Formerly it was picked into shreds by women and children, but it is now usually cut by machines worked by steam.

Description.—Many varieties of isinglass are imported: the Russian kinds are the most esteemed; but the Brazilian, on account of its cheapness, is the most extensively-used kind.

1. Russian and Siberian Isinglass.—The isinglass produced in the Russian empire is principally obtained from the Sturgeons. These cartilaginous fishes constitute the genus *Acipenser*.

The following are the generic characters of Acipenser:—Body elongated and angular, defended by indurated plates and spines, arranged in longitudinal rows; snout pointed, conical; mouth placed on the under surface of the head, tubular, and without teeth (Yarrell). (*History of British Fishes*, ii. 360.) The species are badly determined. Brandt (*Med. Zool.* ii. 1 & 349) has described and figured eight. *Acipenser Sturio*, or the *Common Sturgeon*, is occasionally caught in the river Thames. The species from which Isinglass is procured is the following:

1. A. Huso, Linn. The *Beluga* or *Bieluga*.—Inhabits the Caspian Sea and its tributary streams. Its roe (ovary) is esteemed as *caviare*. Its swimming bladder, when properly prepared, ylelds *leaf isinglass* of three qualities, *fine firsts*, *firsts*, and *seconds*.

2. A. Guldenstadtii, Brandt and Ratzeburg. The *Ossetr* or *Osseter*.—Inhabits the Caspian and Black Seas and their tributary rivers. *Caviare* is prepared from its roe (ovary). From its swimming bladder are obtained both *staple* and *leaf isinglass*. The varieties of the *staple* are, the *Patriarch Astrakhan*, and *Astrakhan firsts*, *seconds*, and *thirds*. The *leaf* varieties are *firsts*, *seconds*, and *thirds*. (T. W. C. Martius, *Lehrb. d. Pharm. Zool.* S. 76, 1838.)

3. A. Ruthenus, Linn. The *Sterlet*.—Inhabits the Black and Caspian Seas and their tributary rivers; and the Arctic Ocean. Its roe yields *caviare*. *Leaf* and *book* (*first* and *second*) *isinglass* are obtained from the swimming bladder.

4. A. Stellatus, Pallas. The *Sewruga*.—Inhabits the Caspian and Black Seas and their tributary rivers. Yields *caviare* and *leaf isinglass*.

But in Russia the acipenser is not the only genus from which isinglass is obtained, for it is also procured from *Silurus Glanis*,[1] which Dr. Royle[2] suggests may be the source of the *Samovey*[3] isinglass of commerce.

Brandt[4] thus describes the preparation of Russian isinglass. The swimming

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[1] Pallas, *Reise durch verschcidene Provinzen des russischen Reichs*. Theit. i. S. 139. Petersburgh, 1771.

[2] *On the production of Isinglass along the Coasts of India, with a notice of its Fisheries*, p. 29. Lond. 1842.

[3] This word is sometimes written *Samovey* or *Simovy*. I have been unable to trace its derivation. Dr. Royle's suggestion appears to me probable, since the Russian name for the Silurus Glanis is *Som*, while Albertus Magnus calls it *Sumus*. The Poles term it *Szum*. (Brandt and Ratzeburgh, *op. supra cit.* vol. ii. p. 31.) Moreover Martius says that staple, leaf, and book isinglass are produced from this fish. Now these are the three forms of the Samovey isinglass.

[4] Though the account above given by Brandt agrees with the statements of Pallas, Gmelin, Georgi, and Tooke, there must be some inaccuracy in it. I have before stated (above) that the innermost membrane of the

bladder is cut open, washed, and then exposed to the air with the inner silvery membrane turned upwards. The latter is then stript off and placed in damp cloths, or left in the outer covering, and prepared or kneaded. It is then taken out of the cloths, and either merely dried (*leaf isinglass*) or twisted in a serpentine manner, between three pegs into the shape of a horse-shoe, heart, or lyre (*long* and *short staple*), or folded in the manner bookbinders fold printed sheets of paper (*book isinglass*). Jackson (Royle, *op. supra cit.* p. 21) has given figures to illustrate the manner in which the staple and book isinglass are made to retain their shapes by skewers.

Several kinds of *leaf isinglass* are imported from Russia. The finest kind is that from Astrakhan, of which one kind is said to be obtained from the Beluga (*Acipenser Huso*). These are imported from St. Petersburgh. The *Samovey leaf* is an inferior kind brought from Taganrod. *Sisane leaf* is the produce of a small fish; each leaf measuring only about $2\frac{1}{2}$ inches each way, and weighing about a drachm: it looks like pieces of dried bladder, marked by two fibrous or muscular bands. *Kroski isinglass* I have not seen; but I am told it is in small circular membranous disks.

Long staple isinglass is of fine quality. It is the produce of the Oural. Of *short staple* three kinds are known: the finest is from the Oural, and is distinguished by the name of Patriarch, but it is very scarce. The *Astrakhan short staple* is one of the best kinds. The *Samovey short staple* is of inferior quality.

Two kinds of *book isinglass* are met with. That from the Oural is of excellent quality. *Samovey book* is an inferior kind.

Siberian purse isinglass is of moderately good quality, and is in general demand.

2. Brazilian Isinglass.—This is imported from Para and Maranham; but it has not hitherto been ascertained from what fishes it is procured; though it is obvious, from a superficial examination of the commercial specimens, that they must have been obtained from at least several species or genera. Mr. Yarrell (*Phil. Trans.* vol. lxiii. 1783) suggests the genera Pimelodus and Silurus as the source of it. It comes over in the form of *Pipe*, *Lump*, and *Honeycomb*.

Pipe Brazilian isinglass must have been procured from a large fish. It is prepared by drying the swimming bladder unopened. In some cases this bladder is imported distended with air. The dried bladders, or *pipes*, as they are called, are from 10 to 12 inches in length, and 2 or $2\frac{1}{2}$ inches broad. Their weight is about 5 ounces. Their shape is somewhat conical, tapering at one extremity, and broader at the other, where, on either side, is a conical cæcal prolongation. It is devoid of smell. *Lump Brazilian isinglass* consists of two swimming bladders placed side by side, considerably separated at one end, and communicating at the other extremity with each other. When perfect, each lump somewhat resembles in shape a torpedo. Its size varies. A perfect, though not very large specimen, now before me, is 8 inches long, and, at the broadest part, 5 inches in breadth. Its weight is $6\frac{1}{2}$ ounces. It consists of three portions, separated by constrictions. The largest portion is 5 inches broad, and $3\frac{1}{2}$ long; flattish in front, rounded posteriorly. It consists of two sacs, placed one on either side. The middle portion is oblong, 3 inches long, and 2 broad; it consists of two sacs, which communicate with those of the preceding portion. The third portion is oblong, $1\frac{1}{2}$ inches long, and $\frac{3}{4}$ of an inch wide. It consists of one sac only, into which both the sacs of the middle portion open. *Honeycomb Brazilian Isinglass* appears to be the largest portion of the lump kind split open.

swimming bladder is insoluble. But according to Brandt's statement, the innermost is the gelatinous membrane. The account which T. W. C. Martius (*Lehrbuch d. Pharmaceut. Zoologie*. p. 71, Stuttg. 1838,) gives of the preparation of isinglass in Russia, confirms my views. The swimming bladders, he observes, are first placed in hot water, carefully deprived of adhering blood, cut open longitudinally, and exposed to the air, with the inner, delicate, silvery membrane upwards. When dried, *this fine membrane is removed* by beating and rubbing, and the swimming bladder is then made into different forms.

The lump variety is sometimes softened, and rolled out into thin ribbons, in this country. On account of its deeper colour and inferior solubility, Brazilian isinglass is not in demand for domestic use; though, as it is sold in the cut state, it is probably intermixed by shopkeepers with the finer kinds of Russian isinglass, and sold as such. As it is moderately cheap and soluble, while it is free from any fishy smell, it is in extensive use for fining by brewers, who are the principal consumers of isinglass.

3. New York Isinglass.—Occasionally *ribbon* isinglass is imported from New York. It is in thin ribbons of several feet long, and from an inch and a half to two inches in width. It is but little used in this country. It is less soluble than the Russian, and affords a dark-coloured solution.[1] Dr. J. V. C. Smith,[2] author of a work on the fishes of Massachusetts, states, that it is obtained from the air-bladder of the common Hake (*Gadus merluccius*), which is thrown into water to macerate for a little while, and is then taken out and pressed between two iron rollers, "by which it is elongated to the extent of half a yard and more. It is then carefully dried, packed, and sent to market. The common cod (*Morrhua vulgaris*) yields a poorer kind of isinglass; but the hake only is known to the extensive manufacturers as fit for their purposes."

4. Hudson's Bay Isinglass.—I have been unable to ascertain from what fish this isinglass is procured.[3] It comes over in the *purse* form. A specimen now before me measures 12 inches in length, and $3\frac{1}{2}$ inches in diameter; its weight is $1\frac{1}{2}$ ounces. It is light yellow, translucent, and free from taste and smell. The inner lining of the sac, which may be readily stripped off, is insoluble in water: the remaining membrane dissolves in boiling water.

5. East India Isinglass.—It appears that, for a long period, this has been exported from Calcutta to China, but it has only recently occupied the attention of Europeans. It is probably the produce of a species of *Polynemus*.[4] But the fishes called, by Dr. Buchanan, *Bola*, and several species of Silurus, especially *Silurus raita*, Buchanan, also yield isinglass (Royle). Most of the specimens of Indian isinglass which I have examined, have an unpleasant fishy odour, which renders them totally unfit for domestic use, and greatly deteriorates their commercial value. A specimen of *East India purse isinglass*, now before me, consists of an unopened swimming-bladder, flattened and dried. Its shape is oval-oblong; its length, 9 inches; its breadth, $3\frac{1}{2}$ inches; its weight, $7\frac{1}{2}$ oz. It has a strong fishy smell, and a dark colour.

Another kind (*East Indian leaf isinglass*) is merely the sac laid open and dried. It is 8 or 9 inches long, 6 or 7 inches broad, and about $\frac{3}{10}$ of an inch thick. A third kind, (*East Indian rolled leaf isinglass*) which I have received from Dr. Royle, appears to have been formed by rolling out the preceeding kind into thin plates. A specimen before me is about 18 inches long, $3\frac{1}{2}$ inches wide, and $\frac{1}{10}$ of an inch thick. Some of the sheets are covered with a thin film of chalk.

Picked East India isinglass, kindly furnished me by Dr. Royle, is in small shreds, two or three inches long, and tapering at the extremities. It is hand-picked in India by the natives.

The composition of this isinglass has been ascertained by Mr. Solly, and will hereafter be stated.[5]

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[1] *United States Dispensatory*: also *Journal of the Philadelphia College of Pharm.* iii. 17 and 92.

[2] In a letter to Dr. S. W. Williams, of Deerfield, Massachusetts, from whom I received the above information.

[3] Richardson, in his *Fauna Boreali-Americana*, part iii. says, that the sturgeons of North America are equally numerous with those of Asia, but that their sounds and roes are utterly wasted.

[4] Mr. M'Clelland (*Journ. of the Asiatic Society of Bengal*, vol. viii. p. 203,) states, that Indian isinglass is yielded by *Polynemus Sele* of Buchanan. But, inasmuch as he obtained only 66 grains of isinglass from one of these fishes, while some of the specimens of commerce weigh from half to three quarters of a pound, it seems tolerably clear that the Indian isinglass of English commerce cannot be obtained from *P. Sele*, but must be procured from some larger fish. It may be the produce of *Polynemus teria*, Buchanan, or the new species of *Polynemus*, referred to by Dr. Cantor (*Journ. of the Royal Asiatic Society*, vol. v. p. 166, Lond.) as the *Sallíah* or *Saccolíh*.

[5] For further details respecting East Indian isinglass, see Dr. Royle's work *On the Production of Isinglass along the Coasts of India, with a Notice of its Fisheries*. Lond. 1842.

6. Cod Sounds.—Cod sounds, in the dried state, are brought from Scotland, and used as a substitute for foreign isinglass. They are, however, usually preserved soft by salting and dressed for the table.

PURITY.—When isinglass is reduced to small shreds (*picked* or *cut isinglass*) it is scarcely possible to distinguish, by the eye, some of the inferior from the finer kinds. The best criteria are its whiteness, freedom from unpleasant odour, and its complete solubility in water.

SUBSTITUTION.—Hartshorn shavings and sole skins (when clean, sweet, and well prepared) are sometimes substituted for isinglass in fining. For domestic uses, *patent gelatine* is frequently used as a substitute for isinglass.

GELATINE.—Gelatine may be extracted from bones, by boiling them in water under pressure; or, more readily, by employing bones, which have been previously digested in hydrochloric acid to extract the phosphate of lime. In this way a nutritious soup is prepared in Paris for the hospitals and other pauper habitations.[1] Gelatine has even been extracted from fossil bones. A soup was prepared from one of the bones of the great Mastodon, by the Prefet of one of the departments of France.

Nelson's Patent Gelatine is obtained from glue-pieces, freed from hair, wool, flesh, and fat.[2] It is probable that inferior kinds of isinglass are also employed. Two kinds of this patent gelatine are made up:—the best (called *gelatine of the first quality*) is opake; it is, by preference, made from cuttings of the hides of beasts, or from the skins of calves; the inferior kind (called *gelatine of the second quality*) is transparent; it is made from non-transparent glue-pieces. Both kinds are sold, cut somewhat in imitation of picked isinglass.

French gelatine is sold in cakes, marked like those of common glue, with the nets on which they have been dried. They are either uncoloured, or coloured red, green, or blue.

Country.	Place of Produce.	Place of Export.	Name and Character.	Prices Per lb. English.		Remarks.
				s. d.	*s. d.*	
Russia	The Oral (Ural)	St. Petersburgh.	Long Staple Ural 1st & 2d.	14 6	13 6	
	The Irtysch and Obi	"	Short ditto Patriarch		none	Very choice and dear.
	Oural and tributaries	"	Ditto ditto 1st & 2d Book	14 6	13 0	
	Astrakhan	"	Thin Leaf 1st & 2d	14 6	to 9 6	These are the sorts which yield the cut.
	The Volga and tributaries	"	Beluga 1st & 2d	14 6	10 6	
			Cut by machine or hand	16 0	14 6 to 13 6 to 9 6	
			Pickings (the brown ends)	8 0		Refuse of the above
	Tributaries of Black Sea	Odessa	Sisane Leaf	2 6		Seldom imported.
	Tchercaskoy	Taganrog	Kroski or Krosky	6 0		Ditto inquired for.
	The Don and tributaries	"	Samovey Leaf 1st & 2d	3 9	3 3	Used for finings.
	Ditto	"	Ditto Book 1st & 2d	4 0	3 6	In great demand.
			Ditto Short Staple	5 0		Seldom imported.
Siberia	The Irtysch and Obi	St. Petersburgh.	Siberian Purse	8 6	7 6	In good esteem.
North America	Hudson's Bay and rivers	Hudson's Bay	Purse	5 6	6 0	A thin insoluble membrane lining the inside.
	United States	New York	Ribbon	No price	——	Not in use.
South America	The Brazils	Maranham and Para	Pipe Brazil	5 0	4 0 3 0	In general demand.
			Lump ditto	5 0	4 0 3 0	
			Honeycomb ditto	3 6	2 0	Not in much repute.
			Cut Brazil	7 6	6 6 6 0	Used perhaps for mixing.
E. Indies	Bay of Bengal	Calcutta	Purse	2 0	4 0	Objected to on account of its fishy smell and imperfect solubility.
			Leaf			
			Pickled	3 0	4 0	When carefully prepared may equal the Brazilian kind.
Scotland	Coasts of Scot.		Cods Sounds	1 9 to	1 6 if dry and sweet.	
England	England		Sole Skins	0 10 if clean, sweet, and well prepared.		

[1] See D'Arcet, *Recherches sur les Substances Nutritives que renferment les Os*, Paris, 1829; also, Edwards' *Recherches Statist. sur l'Emploi de la Gélatine*, Paris, 1835; and *Quarterly Journal of Science*, April, 1827.

[2] See the specification of his patent in *The Mechanic and Chemist* for 1840.

For the preceding table of the different kinds of isinglass at the present time known in the London market I am principally indebted to Mr. James Metcalfe, wholesale dealer in isinglass, of No. 20, Artillery Place, Finsbury Square.

Composition.—Isinglass of fine quality was analysed by John, (Gmelin, *Handb. der Chemie*, ii. 1468,) who found the constituents to be, *gelatine* 70·0, *osmazome* 16·0, *membrane* insoluble in boiling water, 2·5, *free acid* (lactic ?), with *salts of potash* and *soda*, and some *phosphate af lime*, 4·0, and *water* 7·0. These results, however, can scarcely be accurate; for dried flesh, as Berzelius (*Traité de Chim.* vii. 668) observes, does not contain more than 8 per cent. of osmazome; and if isinglass contained 16 per cent. it could not be kept dry when exposed to the air.

Mr. E. Solly, jun. (Royle, *On the Production of Isinglass*, p. 40, Lond. 1842,) examined three specimens of Bengal isinglass, and found the constituents to be *gelatine*, *albumen*, a small portion of *saline* and *earthy substances*, *osmazome*, and a minute trace of *odorous oil*. The quantities of gelatine in three specimens were respectively 86·5, 90·9 and 92·8 per cent.; while those of albumen were 13·5, 9·1, and 7·2 per cent.

Effects and Uses.—The *dietetical* properties of gelatine have been before noticed (vol. i. p. 82). Considered *medicinally* it is an emollient and demulcent. It is employed, dissolved in water or milk, and rendered palatable by acid and sugar, as a nutritious substance for invalids and convalescents.

A solution of isinglass, with some tincture of benzoin, is brushed over black sarcenet to form *Court* or *Black Sticking Plaster*. *Liston's isinglass plaster* consists of oiled silk coated with isinglass. (*Pharmaceutical Transactions*. vol. i. p. 145.) The preparation of *Gelatine Capsules* has been already described (see p. 599).

It is also employed as a clarifying or fining agent (for coffee, wines, beer, &c.) Some of the constituents of these liquors unite with the gelatine, and form insoluble compounds, which precipitate, and in the act of precipitation the gelatine incloses within its meshes the matters which rendered the liquid turbid. The great consumers of isinglass are the brewers,[1] who employ principally the Brazilian variety.

2. OLEUM JECORIS ASELLI.—COD LIVER OIL.

(Oleum Morrhuæ.)

History.—The oil obtained from the livers of the Common Cod, and various other allied species of fish, appears to have been for a long period a popular remedy, in various countries of Europe, for rheumatism, and some other diseases, though its use by medical practitioners is comparatively recent. In 1782 it was strongly recommended in chronic rheumatism by Dr. T. Percival, (*Lond. Med. Journ.* vol. iii. p. 393,) and in 1807 by Dr. Bardsley, (*Medical Reports*, p. 18,) who states that it was in high repute in Lancashire.

Zoology.—This oil is principally procured from the common cod (*Morrhua vulgaris; Gadus Morrhua*) formerly called *Asellus major*;[2] also from allied species, as the Dorse (*Gadus callarias*), the Coal-fish (*Merlangus carbonarius*), the Burbot (*Lota vulgaris*), the Ling (*Lota molva*), and the Torsk (*Brosmius vulgaris*).[3]

Preparation.—In different countries the mode of preparing the oil varies somewhat. The cod oil met with in the London market is the produce of Newfoundland, where, according to Pennant (*Arctic Zoology*, vol. iii. p. 305, 1792), it is thus procured:—"They take a half tub, and, boring a hole through the bottom, press hard down into it a layer of spruce boughs; upon which they place

[1] Full particulars respecting the mode of fining beer are given by Jackson in his *Essay on British Isinglass*, Lond. 1765.

[2] See Schonevelde *Ichthyologia*, p. 18, Hamb. 1624. Pliny (*Hist. Nat.* lib. ix. cap. 28, ed. Valp.) mentions two kinds of *Asellus*,—namely, a smaller kind called *callariæ*, and a kind termed *bacchi*, caught in deep water only.

[3] See Dr. J. H. Bennet's *Treatise on the Oleum Jecoris Aselli*, p. 17, Lond. 1841.

the livers, and expose the whole apparatus to as sunny a place as possible. As the livers corrupt the oil runs from them, and, straining itself through the spruce boughs, is caught in a vessel set under the hole in the tub's bottom." "At Newhaven, near Edinburgh, the fishermen simply boil the livers in an iron pot, and then filter it [the oil] through a towel containing a little sand." (J. H. Bennett.)

Description.—Among London dealers I have met with but one kind of Cod-liver oil. Its colour is chestnut brown, and its odour is like that of boiled cod's liver. It is the *Cod Oil* of commerce, the *oleum jecoris aselli fuscum* of continental pharmacologists. It is extensively used by curriers in dressing leather.

Three other varieties are met with in Germany. They are distinguished as the White (*oleum album*), the Yellow (*oleum flavum*), and the Red (*oleum rubrum*), Cod Liver Oils. These differences in colour depend probably in part on the species of fish from which each variety is procured, and in part also on the mode of preparation. Thus the Dorse (*Gadus callarias*) yields a white oil. In Germany the deep golden yellow-coloured oil is, for the most part, used medicinally.

Composition.—Cod oil has been analysed by several chemists. The most recent analysis is that of Marder, (*Pharm. Central-Blatt für* 1837, p. 536.) In 200 grs. of the oil he found the following substances :—

In the Clear Oil.		*In the Brown Oil.*	
Green soft resin	0·104	(brown resin)	0·130
Brown hard resin	0·026	(black resin)	0·156
Gelatine	0·312		0·936
Oleic acid	111·833		95·000
Margaric acid	20·625		8·000
Glycerine	16·832		18·000
Colouring matter	11·500		25·000
Chloride of calcium	0·1046		0·2092
Chloride of sodium	0·1179		0·1883
Sulphate of potash	0·0361		0·0614
	161·4906		147·6809

Since the above analyses were made *iodine* and *bromine* have been detected in this oil. Herberger (*Ibid. für* 1839, p. 854,) examined several oils, and obtained the following results :—

1000 *parts of Cod Liver Oil.*		*Iodide of Copper.*	*Bromide of Potassium.*	*Iodine.*	*Bromine.*
1. White Oil.	From Bremen	1·355	0·255	0·903	0·170
	Mainz	—	—	—	—
	Mannheim	0·439	—	0·293	—
	Frankfort	—	—	—	—
2. Brown Oil.	From Stuttgard	0·563	—	0·375	—
	Mannheim	2·347	0·435	1·564	0·290
	Hamburg	—	—	—	—
	Bremen	2·586	0·441	1·723	0·294

Physiological Effects.—At the commencement of its use it frequently causes nausea, disagreeable eructation, and occasionally vomiting. In the dose of a tablespoonful it acts as a laxative, diaphoretic, and diuretic, (Schenk, *Hufeland's Journal*, Bd. xxii. 1822.) But Taufflied (*Lond. Med. Gaz.* Feb. 28, 1840,) declares that in doses of from two to four spoonsful a day, he never found it "exert any appreciable influence upon the urine or perspiration, or produce any disturbance in the economy." The disagreeable flavour of the oil sometimes creates nausea and sickness, but when habit has surmounted the repugnance to it these effects cease. In several cases it has proved emmenagogue (Bennett, *op. supra cit.* pp. 46 and 47); and on some occasions has given rise to a cutaneous eruption (*Ibid.* pp. 16 and 47). Dr. Bardsley found that most patients were disposed to get fat under its use.

Uses.—Though it has been used more or less successfully in a considerable number of diseases, the cases in which it has proved most successful are those

of a gouty, rheumatic, or scrofulous nature. But even in these it requires a very long-continued use to prove successful. The most recent writer on its employment observes that its use must be continued long, "at least a month, often six weeks, and sometimes for years." As the oil contains iodine, and as it proves most successful in those maladies in which this element proves successful, it has been suggested that iodine is its active principle. Taufflied, however, denies this, and asserts that the properties of the two are not identical, for the one succeeds where the other fails. Is bromine the active agent?[1]

The oil is best adapted for relaxed, torpid, and phlegmatic temperaments, and for scrofulous subjects. In plethoric habits, and where irritation of the stomach and bowels, or inflammation, exists, its use is contra-indicated.

Rheumatism and *scrofula* are the diseases in which its employment has proved most successful. In *rheumatism* it is indicated in the chronic forms of this disease, where the muscles and tendons are rigid, and the joints nearly inflexible. In chronic *gout* it is said not to be so efficacious. In *scrofula* it has proved successful in most of the forms of this disease, but especially when it affects the bones (as in rickets, caries, &c.), and in tabes mesenterica. In the latter most intractable form of the disease, its efficacy has occasionally been most surprising. Even in phthisis, benefit is said to have been obtained by its use.

The oil has also been employed in some other diseases, with more or less success. In *chronic skin diseases* attention was drawn to its use, some years since, by Dr. Marshall Hall. (*Lond. Med. Gaz.* vol. x. p. 796.) In tinea favosa, impetigo, and chronic eczema, it has been found efficacious as a topical application. In *chronic ophthalmia*, especially of a scrofulous kind, it has been given internally, and, in some cases, applied to the eye with benefit. In *paralysis* also it has been found beneficial by Schuppmann.[2]

ADMINISTRATION.—For an adult, the dose at the commencement is a tablespoonful, which may be gradually increased to six times this quantity (!). This dose is to be repeated two, three, or four times a day for several weeks, or even months. One patient consumed thirty-six lbs. of oil in two years and a half!! (Taufflied). Dr. Bardsley gave from ℥ss. to ℥iss. twice or thrice a day in warm table beer. For children of twelvemonths or under, the dose is a teaspoonful night and morning. The addition of some aromatic oil (as of lemon, peppermint, cassia, or anise) partly covers the unpleasant taste and smell. It is sometimes taken in the form of an emulsion. Peppermint water and lozenges have been recommended for covering the unpleasant taste of the remedy.

CLASS IX. *AVES.—BIRDS.*

ESSENTIAL CHARACTERS.—Vertebrated animals, with red and warm *blood*, respiring by *lungs*, and the young of which are produced from *eggs*. Body covered with *feathers*, and general conformation organized for flying.

ORDER I. GALLINÆ, *Linnæus*.—GALLINACEOUS BIRDS.

ESSENTIAL CHARACTERS.—*Bill* short, convex, in some genera covered by a *cere*. Upper *mandible* bending from its base or only at the point; nostrils lateral, covered by a membrane, naked or feathered. *Tarsus* long. Three *toes* before, united at their base by a membrane; hind toe articulated on the tarsus above the junction of the anterior toes.

GAL'LUS DOMES'TICUS, *Temminck*.—THE DOMESTIC COCK AND HEN.

Phasianus Gallus, *Linn. L. E.*

(Ovum, *L.*—The Egg, *E.*)

HISTORY.—No mention is made of this animal in the Old Testament. Both

[1] For an account of Ascherson's speculations on the *modus medendi* of this oil, see Dr. Bennett's *Treatise*, before cited, p. 53.

[2] For further details respecting the therapeutic uses of this oil, the reader is referred to Richter's *Ausführl. Arzneim.* Bd. i. S. 235; Dierbach's *Neuest. Entd. in d. Mat. Med.* 1828, p. 270; and *Ibid.* Bd. i. p. 352, 1837; also Dr. Bennett's *Treatise*, already quoted.

the male and female are referred to in the New Testament. (*Matthew*, xxvi. and xxiii.) Aristotle (*Hist. de Animal*,) calls the cock ἀλεκτρυών,—the hen ἀλεκτορίς.

Zoology. **Gen. Char.**—*Bill* of medium size, strong, base naked. Upper *mandible* arched convex, bent towards the point. *Head* surmounted by a crest or plume. *Ears* naked. Three *toes* before, united to the first joint; the hind toe raised from the ground. *Tarsus* with a long and bent *spur*. Middle *feathers* of the tail arched. *Wings* short.

Sp. Char.—*Comb* dentated. *Throat* wattled. *Feathers* of the neck linear and elongated. *Body* variegated with beautiful colours. *Tail* compressed and ascending. *Comb* and *wattles* of the female less than those of the male.

Some doubt exists as to the origin of our domestic cock and hen. Sonnerat (*Voy. aux Ind. Orient.* ii. 148,) affirms, that all the varieties originate from the *Jungle Fowl* (*Gallus Sonnerati*); while Temminck refers them to the *Javan Fowl* (*Gallus bankiva*).

Structure of the Ovarium and Developement of the Egg.—The Ovarium (*racemus vitellorum*) or *egg-organ*, consists of a cluster of ova, in a hen beginning to lay, about 500 in number. The stalk by which each ovum is attached to the ovarium is called the *petiolus*. The size of the ova is exceedingly various: when quite ripe, they are as large as the yelk of an egg; the smaller ones are white, the larger ones yellow. Each ovum, when ripe, is composed of a *calyx*, the *yelk-bag*, and the *yelk*. The *calyx* constitutes the outer coat or covering of the ovum, and consists of two layers—an outer one, derived from the peritoneum, and an inner one, which

Fig. 261.

A Segment of the Yelk.

(The division has been made in the direction from the cicatricula to the centre.)

Fig. 262.

Cumulus cicatriculæ.

The convex portion faces the yelk. On the top is a small crater, the inner opening of the *pore*.

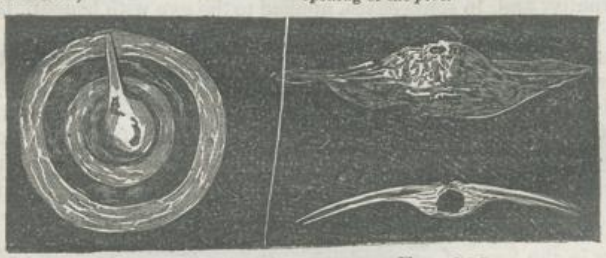


Fig. 263.

Section of the Cicatricula, showing the vesicula in situ.

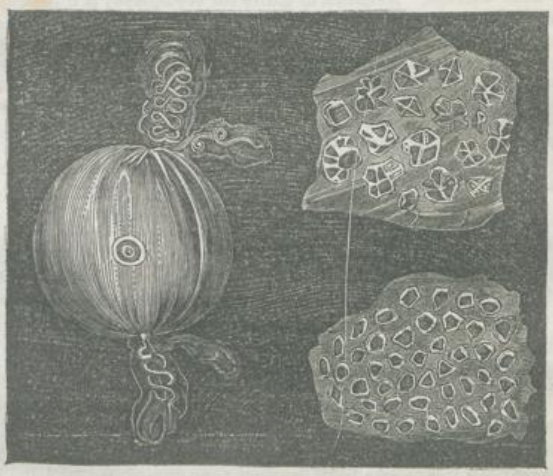
is somewhat thicker. Between these two coats the vessels ramify. The *petiolus* is merely a prolongation of the calyx: it is studded with a number of small ova, resembling vesicles. On that part of the calyx of a ripe ovum which is opposite the petiolus, is a whitish curved stripe, called the *stigma*, indicating the spot where the calyx bursts, to allow the escape of the yelk. The *yelk-bag*, or *membrana propria vitelli*, is within the calyx, and closely invests the yelk. It is a flocculent, delicate, fine coat. In the early state of the ovum, the *yelk* is constituted of a pellucid fluid lymph, and is hardly distinguishable from the *vesicula cicatriculæ*. It then becomes whitish, and subsequently yellow, globules of oil making their appearance. In a ripe ovum, it is viscid, tenacious, and of an orange yellow colour; and lies in the calyx, with its long axis towards the petiolus. It is composed of three layers, the middle one having the deepest colour; the innermost enclosing a white fluid called the *albumen centrale* (or *substantia alba vitelli*), from which passes *a little canal* to that part of the surface of the yelk called the *cicatricula*.

The internal surface of the yelk-bag is lined with a very thin stratum of globules, in form and figure like those of the blood, but arranged organically. The *cicatricula*, or *tread*, (as it is improperly called), is formed by an accumulation of these globules forming a mammiform heap, the convexity of which is towards the centre of the yelk, and is usually situated nearer the petiolus than the stigma. In the top of this is the so-called pellucid *pore*, which is occupied by a small vesicle discovered by Purkinje, (*Symb. ad ovi avium histor. ante incub.* Lipsiæ, 1830,) and called by him the *vesicula germinativa* or *vesicula cicatriculæ*. It is found in all the ovarian ova, and seems to be a natural organ, since it is found in the ova of fowls which have never had access to the male. When the yelk falls into the infundibulum, this vesicle disap-

pears. The Oviduct has some resemblance to a convoluted intestine. It is situated on the left side of the animal. Its superior expanded free extremity is called the *infundibulum*, the edges of which are fimbriated. Inferiorly, the oviduct opens into the cloaca. It is attached to the spine by the *mesometrium*. The *infundibulum*, or expanded portions of the tube, receives the ovum as it escapes from the calyx of the ovarium. The upper part of the oviduct is lined by a fine villous membrane, covered with follicles secreting the albumen or glaire, and thrown into a number of longitudinal folds. The first layer of albumen which the ovum receives forms the *membrana chalazifera* of Dutrochet; at either end of which is a soft, pellucid,

Fig. 264. Fig. 265.

(*Yelk, and its Appendages.*)



The *spiral chalazæ* are seen at the extremities of the yelk; the circular *cicatricula* in the middle; and the *zona albicans* extending from one chalaza to the other.

Polygonal pieces (crystals?) *of Chalk, forming the rudiments of the Shell of the Egg.*

albuminous nodule, which may be regarded as the *rudimentum chalazarum*. During the descent of the ovum in the oviduct, it receives fresh deposits of albumen; and, as it undergoes spiral rotations in its passage, the above-mentioned processes become curved spirally, and in the perfect egg constitute the *chalazæ*, *grandines*, *appendices albuminis*, or the *poles* or *treddles*. From one chalaza to the other are observed, in many eggs, one or more white striæ, formed by a thickening of the membrana chalazifera. Vicq d'Azyr called this appearance the *zona albicans*.

The *albumen*, *glaire*, or *white* of the egg, is not uniform in its consistence. The thickest portion is that which is first deposited around the yelk. Proceeding from without inwards, the three layers of albumen are denominated *albumen primum*, *a. secundum*, and *a. tertium*. Just before the egg arrives at that part of the oviduct called the uterus, it receives its outer coat, the *pellicula ovi*. In the middle, or so-called uterine portion of the oviduct, is formed the *calcareous shell*. Some eggs are expelled without it; these are termed *bon eggs*. The chalk is first deposited in small polygonal pieces, having a crystalline appearance; but, when the deposit has attained a certain thickness, all traces of crystallization are lost.

Hab.—Domesticated in all the four quarters of the globe.

Description.—Eggs (*ova*) are too well known to need much description. Their specific gravity varies from 1·080 to 1·090. By keeping they become lighter, by the evaporation of a portion of the water. Dr. Prout (*Phil. Trans.* for 1822, p. 377,) found, that in two years an egg lost $544\frac{3}{16}$ grains. The relative weights of the different parts of the egg are, according to the same authority, as follows:—*shell and membrane*, 106·9; *albumen*, 604·2; *yelk*, 288·9; (total, 1000). By boiling in water an egg loses two or three per cent.

1. Egg-shell (*Testa Ovi; Putamen Ovi*).—This consists, according to Prout, of *carbonate of lime*, 97; *phosphate of lime and magnesia*, 1; *animal matter, with traces of sulphur and*

iron, 2. The chalk renders the egg absorbent and antacid; hence its use to neutralize the acidity of wines.

2. Pellicula Ovi (*Membrana Putaminis*).—An albuminous membrane which lines the shell. It is soluble in alkalis, and from its solution is precipitated by acids. It weighs about 2·35 grains (the whole egg being supposed to be 1000 grains). At the larger end of the egg it forms the *follicula aeris;* the air of which, according to Bischoff, contains 23·475 per cent. of oxygen.

3. White or Glaire (*Albumen* seu *Album Ovi*) consists of two or three laminæ, which are not homogeneous, as two parts at least are discernible,—viz. a solid, probably organized albumen, having the appearance of a very fine delicate membrane, forming a series of cells, in which is contained the liquid albumen. Glaire or white of egg consists, according to Gmelin, of *albumen* 12·0, *mucus* 2·7, *salts* 0·3, and *water* 85·0. The coagulability of albumen by heat distinguishes it from caseum. Albumen or glaire (or *ovalbumen*) is distinguished from albumen of the serum of the blood (*seralbumen*) by its being coagulated by ether. The membranous tissue in which the liquid albumen of eggs is contained is said by Couerbe to be devoid of nitrogen: he calls it *albumenin* or *oonin*.

4. Yelk (*Vitellus Ovi*) is a kind of yellow emulsion, consisting of oil suspended in water by means of albumen, and enclosed in a sac called the *yelk bag*. On its upper surface is seen the cicatricula. At the extremities are the twisted flocculent *chalazæ*. The yelk consists of *yellow oil with crystallizable fat*, 28·75, *albumen* containing *phosphorus* 17·47, and *water* 53·8. The yellow oil (*oleum ovi*) may be obtained by boiling the yelk hard, and digesting in ether or alcohol, which dissolves the oil. By distilling off the alcohol from the filtered tincture, the oil is left behind.

Physiological Effects and Uses.—Both the glaire and the yelk are highly nutritive; the latter, on account of the oil which it contains is somewhat less easy of digestion than the white. Both are more readily assimilated when in the soft state than when hardened by heat. Considered as medicinal agents, they are emollient and demulcent. The glaire is a valuable agent in the treatment of poisoning by bichloride of mercury (see vol. i. p. 623), sulphate of copper (see vol. i. p. 640), and the bichloride of tin. Its efficacy in these cases depends on its chemical properties. The glaire is also used as a demulcent or sheathing agent in all cases of corrosive or acrid poisons. The yelk is a constituent of the *mistua spirritûs vini gallici* (see vol. i. p. 323.) It is also used for preparing emulsions. Its oil has been applied to cracked nipples.

The white or glaire is employed as a clarifying agent for wines and some other liquids. Its efficacy depends on its coagulation, by which it entangles in its meshes the impurities, with which it either rises to the surface or precipitates. When the liquid to be clarified does not spontaneously coagulate the albumen, it is necessary to apply heat. Bookbinders use the glaire as a varnish.

Class X.—*MAMMALIA*, Linnæus—*MAMMALS*.

Essential Characters.—*Vertebrated* animals with red and warm *blood*, breathing through *lungs*, *viviparous*, and suckling their young with milk formed in their breasts or *mammæ*.

Order I.—CETACEA, *Linnæus*.—THE CETACEANS.

Essential Characters.—*Body* pisciform, terminated by a caudal appendage, cartilaginous, and horizontal. Two anterior extremities formed like *fins*, having the bones which form them flattened and very soft. *Head* joined to the body by a very short thick neck. Two pectoral or abdominal *mammæ*. *Ears* with very small external openings. *Brains* large. *Pelvis* and *bones* of the posterior extremities represented by two rudimentary bones lost in the flesh.

PHYSETER MACROCEPH'ALUS, *Linn. L. E.*—GREAT HEADED CACHALOT.

(Concretum in propriis cellulis repertum, *L.*—Cetine nearly pure, *E.*—Cetaceum, *D.* [U. S.])

History.—Cuvier (*Rech. sur les Ossemens Foss.* t. v. p. 328,) is of opinion that this animal is perhaps the *Physeter* of Pliny, (*Hist. Nat.* ix. 3, and xxxii. 53, ed. Valp.)—the *Orca* of some other Latin writers.

Zoology. **Gen. Char.**—Inferior *teeth* eighteen to twenty-three on each side of the jaw. *Upper jaw* broad, elevated, without teeth, or with these short and

concealed in the gum; *lower jaw* elongated, narrow, corresponding to a furrow of the upper, and armed with thick and conical teeth entering into corresponding cavities in the upper jaw. *Spiracular orifices* united at the upper part of the snout. *A dorsal fin* in some species, a simple eminence in others. *Cartilaginous cavities* in the superior region of the head, filled with *oily matter*.

Sp. Char.—Lower *teeth* twenty to twenty-three on each side, recurved and pointed at the extremity. Small conical teeth concealed in the upper gums. *Tail* narrow and conical. *A longitudinal eminence* on the back above the anus. Upper part of the body blackish or slate blue, a little spotted with white. *Belly* whitish. *Length* forty-five to sixty feet.

The *snout* of the cachalot, notwithstanding its prodigious length, is formed only by the maxillæ on the sides, by the intermaxillæ towards the median line, and by the vomer on this line. The intermaxillæ project to form the anterior part of the snout. Posteriorly the right one ascends higher than the left. The *spout hole* is single (in most cetacea it is double), and directed towards the left side, so that whenever the animal spouts water, it is to that side only.

SEAT OF SPERMACETI.—Spermaceti is found in several parts of the body of the animal mixed with the common fat. The head, however, is the grand reservoir for it. Here it is found (mixed with oil) in a large excavation of the upper jaw, anterior to, and quite distinct from, the true cranium which contains the brain. Mr. Hunter (*Phil. Trans.* vol. lxxvii. 390,) states that the spermaceti and oil are contained in cells, or cellular membrane, in the same manner as the fat in other animals; but that besides the common cells there are larger ones, or ligamentous partitions going across, the latter to support the vast load of oil, of which the bulk of the head is principally made up.

There are two places in the head where this oil lies; these are situated along its upper and lower part: between them pass the nostrils, and a vast number of tendons going to the nose and different parts of the head. The purest spermaceti is contained in the smallest and least ligamentous cells. It lies above the nostril, along the upper part of the head, immediately under the skin and common adipose membrane. These cells resemble those which contain the common fat in the other parts of the body nearest the skin. That which lies above the roof of the mouth, or between it and the nostril, is more intermixed with a ligamentous cellular membrane, and lies in chambers whose partitions are perpendicular. These chambers are smaller the nearer to the nose, becoming larger and larger towards the back part of the head where the spermaceti is more pure.

Mr. Hunter discovered about the nose, or anterior part of the nostril, a great many vessels, having the appearance of a plexus of veins, some as large as a finger. On examining them, they were found loaded with spermaceti and oil; and some had corresponding arteries. They were most probably lymphatics, whose contents had been absorbed from the cells of the head.

Hab.—Pacific Ocean, Indian and Chinese Seas. Especially off New Guinea and parts adjacent, Timor, Australasia, Polynesia, Peru, &c.

EXTRACTION OF SPERMACETI.—In the right side of the nose and upper surface of the head of the whale is a triangular-shaped cavity, called by the whalers "the case." Into this the whalers make an opening, and take out the liquid contents (oil and spermaceti) by a bucket. The dense mass of cellular tissue beneath the case and nostril, and which is technically called "junk," also contains spermaceti, with which and oil its tissue is infiltrated. The spermaceti from the case is carefully boiled alone, and placed in separate casks, when it is called "*head matter*."[1]

PURIFICATION.—The substance called "*head matter*" consists of spermaceti and sperm oil. Its colour is yellow. Its consistence varies with the temperature. In cold weather it consists of a congealed mass (spermaceti) surrounded and infiltrated by oil. To separate the latter as much as possible, it is put into filter bags. The solid thus obtained is then submitted to compression in hair bags, placed in an hydraulic press. It is then melted in water, and the impurities skimmed off. Subsequently it is remelted in a weak solution of potash. It is then fused in a tub by the agency of steam, ladled into tin pans, and allowed slowly to concrete into large, white, translucent, crystalline masses.

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[1] Beale, *Nat. Hist. of the Sperm Whale*, p. 186, 1839; also F. D. Bennett, *Narrative of a Whaling Voyage round the Globe*, from the year 1833 to 1836, vol. ii. pp. 153, 228, Lond. 1840.

PROPERTIES.—Commercial spermaceti (*cetaceum; sperma ceti*) usually contains a minute portion of sperm oil, which is best removed by boiling in alcohol. Absolutely pure spermaceti (called *cetine*) is a white laminated substance, without taste, and almost odourless. By the addition of a few drops of alcohol or almond oil, it may be reduced to powder. It is insoluble in water, and slightly soluble only in alcohol, even at a boiling temperature. By saponification with potash, 100 parts of spermaceti yield 60·96 parts of margaric and oleic acids, 40·64 parts of ethal, and 0·9 parts of a yellow extractiform substance.

ETHAL is a crystalline solid, composed of C^{16} H^{17} O. By distillation with phosphoric acid, it yields an oily substance called *cetene*, composed of C^{16} H^{16}. So that ethal may be regarded as a hydrate of cetene.

COMPOSITION.—The ultimate analysis of pure spermaceti or cetine was made by Chevreul. (Gmelin, *Handb. d. Chem.* ii. 440.) The proximate composition of the same substance has been ascertained by Dumas and Peligot. (*Ann. de Chim. et de Phys.* t. lxxii. p. 5.)

Chevreul's Analysis.	
Carbon	81·660
Hydrogen	12·862
Oxygen	5·478
Cetine	100·000

Dumas and Peligot's Analysis.

	At.	Eq. Wt.			At.	Eq. Wt.
Margaric Acid	2	1064	or	Margarate of Cetene	2	1288
Oleic Acid	2	1040		Hinoleate of Cetene	1	1152
Cetene	3	336		Water	3	27
Water	3	27				
Cetine	1	2467	or		1	2467

PHYSIOLOGICAL EFFECTS AND USES.—Emollient and demulcent. Internally it has been employed in irritation and inflammation of the alimentary canal (as diarrhœa and dysentery) and of the bronchial membrane (catarrh); but its internal administration is now nearly obsolete. Its principal medicinal use is in the preparation of cerates and ointments.

ADMINISTRATION.—When employed internally it is generally exhibited in the form of an emulsion (*spermaceti mixture*) made with the yelk of egg. Or it may be made with mucilage.

1. CERATUM CETACEI, L. (U. S.); *Ceratum simplex*, E.; *Unguentum Cetacei*, D.; *Spermaceti Cerate*. (Spermaceti, ℥ij.; White Wax, ℥viij.; Olive Oil, Oj. *L.*—Olive Oil, 6 parts; Bleached Bees-wax, 3 parts; Spermaceti, 1 part, *E.*—White Wax, lb. ss.; Spermaceti, lb. j.; Prepared Hogs Lard, lb. iij. "Heat the oil gently, add the wax and spermaceti, stir the whole briskly when it is fluid, and continue the agitation as it cools," *E.*)—[Spermaceti, ℥i.; White Wax, ℥iij.; Olive Oil, f℥vi. U. S.]—If cold oil be added to the wax and spermaceti, the preparation is apt to be somewhat lumpy. As the white wax of commerce is always largely mixed with spermaceti, this preparation has never the precise composition intended by the College. Practically, however, this is of no consequence.—This preparation is employed as a mild and simple dressing for blisters and excoriated surfaces.

2. UNGUENTUM CETACEI, L.; *Spermaceti Ointment*. (Spermaceti ℥vj.; White Wax, ℥ij.; Olive Oil, f℥iij. Having melted them together with a slow fire, stir assiduously until they become cold.)—A softer preparation than the preceding, but used in the same cases.

AMBERGRIS.—The substance called Ambergris (*Ambra grisea*) is procured from the Cachalot or Sperm Whale. (*Phil. Trans.* vol. lxxiii. p. 226, for the year 1783.) In this country it is used as a perfume only: on the continent it is employed in medicine. It appears to be the indurated fæces (perhaps somewhat altered by disease) of the animal. Mr. Beale (*op. supra cit.* p. 135,) collected some of the semi-fluid fæces, and found that the dried mass had all the properties of ambergris. It is a solid, opaque, grayish, striated substance, having a pleasant musk-like odour, and which is supposed to be derived from the Squid (*Sepia moschata*) on which the animal feeds; and in support of this opinion it must be mentioned that the horny beaks of this animal are found imbedded in the masses. Its sp. gr. is 0·908 to 0·92. John analyzed it, and found it to consist of *a peculiar non-saponifiable fat* (*ambreine*) 85, *sweet balsamic alcoholic*

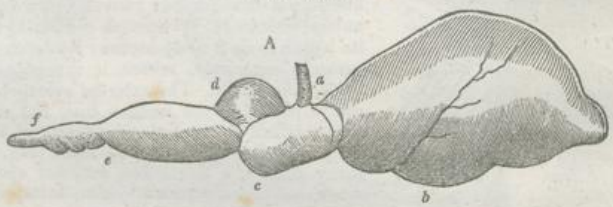
extract, with benzoic acid, 2·5, *aqueous extract, benzoic acid*, and *chloride of sodium* 1·5. *Ambreine* is soluble in alcohol, and by the action of nitric acid furnishes a peculiar acid called *ambreic acid*. The *effects* of ambergris on the system are said to be analogous to those of musk. In the shops is kept an alcoholic tincture (called *essence of ambergris*) which is employed as a perfume only.

Order II.—RUMINANTIA, *Cuvier*.—RUMINANTS.

Pecora, *Linnæus*.

Essential Characters.—No *incisors* in the upper jaw; in the lower usually eight; a vacant space between the incisors and molars, but in which, in some genera are found one or two canines. *Molars* twelve in each jaw, the crown marked with two double crescents of enamel, of which the convexity is outwards in the lower jaw, and inwards in the upper. No *clavicles*. *Extremities* disposed for walking. Two *toes* furnished with hoofs; metacarpal and metatarsal bones united. Four *stomachs; intestines* long. Two or four inguinal *mammæ*. *Horns* in the males, and often in the females of most species.

Fig. 266.



The four Stomachs of the Sheep.

a, The gullet.—*b*, The paunch.—*c*, The honeycomb.—*d*, The manyplies.—*e*, The reed.—*f*, The commencement of the duodenum.

MOSC'HUS MOSCHIF'ERUS, *Linn. L. E. D.*—THE MUSK ANIMAL.

(Humor in folliculo præputii secretus, *L.*—Inspissated secretion in the follicle of the prepuce, *E.*—Concretum *Moschus* dictum, *D.*)

(Moschus, U. S. Musk.)

History.—Aristotle, Pliny, Ælian, and Oppian, make no mention of this animal. Ætius (*Serm.* xxvi. t. ii. cap. cxiii.) is the earliest writer who notices the perfume. None of the etymologies hitherto given for the word *Musk* (μόσχος) are satisfactory.

Zoology. **Gen. Char.**—*Incisors* $\frac{0}{8}$. *Canines* $\frac{1}{0} - \frac{1}{0}$. *Molars* $\frac{6}{6} - \frac{6}{6} = 34$. *Canines* wanting altogether in the females; superior canines large in the males. *Ears* long, pointed. *Body* slender. *Feet* with hoofs, separated and enveloping the last phalanges. *Tail* very short. Two inguinal *mammæ*.

Fig. 267.

Moschus moschiferus.

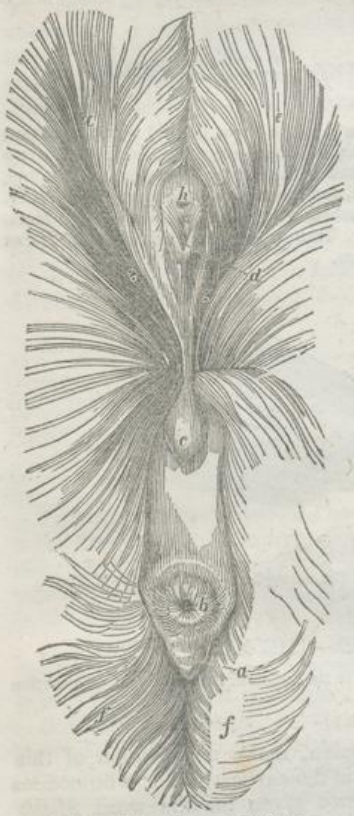
Sp. Char.—*Fur* of a gray-brown; *hair* coarse. A *pouch* before the prepuce of the male, filled with an unctuous musky substance. *Size* of the roe-buck.

The absence of *horns* and the presence of canine teeth distinguish the animal from the Deer (*Cervus*). The *Stylocerus moschatus* is the connecting link between the deer and the musks. It has the horns of the one, and the canine teeth of the other.

The most interesting part of the musks is the *preputial musk sac*. Cuvier (*Règne Animal*, i. 259, nouv. ed. 1829,) says no other species of Moschus possesses a musk sac; but this statement is not correct. *M. Altaïcus* Eschscholtz (*M. Moschiferus Altaicus* Brandt), *M. Napu*, and *M. Javanicus*, are also said to possess musk sacs.

ANATOMY OF THE MUSK SAC.—The sac is peculiar to the male animal. If he be supposed to be laid on his back, and the belly examined, we observe behind the navel, and immediately in front of the preputial orifice, a small aperture (*external aperture of the musk sac*) leading into the *musk canal*, which terminates in the cavity of the *musk sac*. The aperture is about half an inch from the umbilicus, and usually about a line, or a line and a half, from the preputial orifice. In some preparations in my possession the distance is much greater. The preputial orifice is somewhat more prominent, and has a number of longish hairs projecting from it, in the form of a brush or hair-pencil; whereas the external musk aperture is placed in a depression, and is smooth. The relative position of the parts is shown by the subjoined sectional view of the musk sac *in situ*, (p. 803, from Brandt.)

FIG. 268.



Belly of Moschus moschiferus.
(From Pallas.)

a. Tail. *b*. Anus. *c*. Scrotum. *d*. Preputial orifice. *e*. Abdomen. *h*. Orifice of the musk sac.

The *musk sac* is of an oval form, rather broader at the anterior than at the posterior part. It is flat and smooth above, where it is in contact with the abdominal muscles, but convex below (supposing the animal standing). Its breadth is from 1¼ to 1¾ inches; its length from 2 to 2½ inches; its depth varies, being greatest anteriorly, where it is about one-half or 3-4ths of an inch. The *external aperture* of the musk sac is placed in the median line, but nearer to the anterior than the posterior extremity of the sac. The *musk canal* is about 1 or 1½ lines long, its diameter being about one line. The *internal aperture* of the musk sac is surrounded by fine hairs, which readily fall off, and are found in the musk of commerce.

The following are the parts of which the musk sac consists:—

1. *Outer or hairy coat or skin.*—This is a continuation of the hide, and covers the convex portion of the sac. Its hairs are stiff and smooth, and disposed in a circular manner around the external musk orifice.

2. *Muscular coat.*—This consists of two strata of fibres which surround the sac in a circular form. Pallas (*Spicileg. Zoolog.* fasc. xiii.) states, that they arise from the groin and unite anteriorly with the panniculus carnosus. He regards them as the compressors and retractors of the follicle and of the prepuce, when the genital organ is thrust out. The same naturalist has described two retractors of the penis.

Between the two strata of muscular fibres is placed the *penis*, which is remarkable from the circumstance of the urethra projecting beyond the extremity of the glans. In its usual state the penis lies rolled up within the belly.

On the inner surface of the muscular fibres is a number of small oblong or roundish *glands* compared by Pallas to the meibomian glands of the palpebræ.

3. *Fibrous coat.*—This is the most external of the proper coats of the musk sac. On its inner surface are numerous depressions or cells, surrounded by ramifying folds, within which the blood-vessels ramify. This coat is continuous (through the musk orifice) with the corium.

4. *Pearly coat.*—A soft delicate membrane, shining like mother-of-pearl. It lines the cells, and covers the folds of the fibrous coat.

5. *Epidermoid coat.*—It is the inner lining of the sac. Its external layer is silvery white; its internal one yellowish or reddish brown.

6. *Musk glands.*—In each of the depressions observed on the internal coat of the musk sac, are found two or more irregular shaped bodies of a yellowish or reddish-brown colour. These bodies consist of a central brownish mass (supposed to be glandular), covered by a fine membrane.

7. *Contents of the Musk Sac.*—Pallas found, that, in young animals, the sac was empty and contracted. In the adult animal it contained about a drachm and a half of musk, and in old animals more than two drachms. But these quantities must be below the average, since the dried pods of commerce contain on the average more musk than this. Mr. Campbell (*Journ. of the Asiatic Soc. of Bengal*, vol. vi. p. 119, Calcutta, 1827) describes the musk found in the sac as soft, reddish-brown, granular, and having the appearance of soft gingerbread.[1]

[1] For further details respecting the structure of the musk sac consult Brandt and Ratzeburg, *Med. Zool.* Bd. i.

Hab.—Asia, between 16° and 58° north latitude, and 92° and 155° of east longitude. Especially on the Atlas and Himalayan ranges. China, Cochin-China, Tonquin, Tartary, and Siberia, have all been celebrated for the musk. The animal is timid, and dwells in cold mountainous districts, where coniferous plants abound.

Fig. 270.

Musk Sac.

a. Truncated Penis.

Fig. 271.

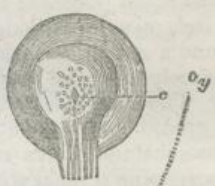
Musk Sac, deprived of its hairy coat, to show its muscular coat.

a. Portion of the truncated Penis.
c. Aperture of the Musk Sac.

Fig. 272.

Musk Sac, deprived of its hairy coa and circular muscular fibres.

c. Aperture of the Musk Sac.



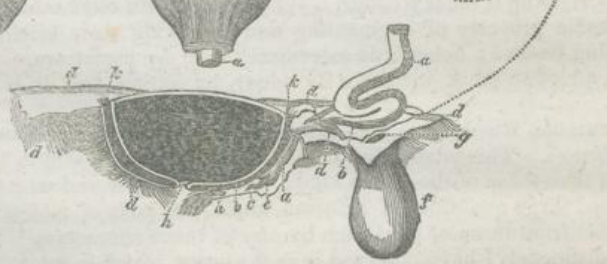


Fig. 269.

Vertical Section of the Musk Sac in situ.

a. The penis.—*c*. Urethra.—*d*, *d*, *d*. The hide.—*e*. Glans penis.—*f*. Scrotum.—*g*. Spot where the spermatic cord is cut off.—*h*. Aperture of the musk-sac.—*i*. Preputial orifice.—*k*, *k*. Muscular coat of the sac.—*y*. Position of the anus.

Capture of the Animals.—Various methods of catching the animals are adopted. Sometimes they are taken by snares or gins, sometimes by pitfalls, sometimes by shooting them. The Tungouses, one of the native tribes of Siberia, employ the bow and arrow only.

Description.—Three kinds of musk are described, viz. *China*, *Russian*, (or *Kabardine*), and *Bucharian*. I am acquainted with the two first only.

1. China, Tonquin, or Thibet Musk, (*Moschus tunquinensis* seu *tibetanus*).—This is imported in small rectangular boxes (*catties*), about $7\frac{3}{4}$ inches long, $4\frac{3}{8}$ inches broad, and $4\frac{1}{2}$ deep; covered externally by silk, and lined with sheet-lead and paper. These boxes contain about twenty-five sacs or pods, each wrapped separately in paper. On the outside of the lid of some of the boxes is marked "*Lingchong Musk*;" and on the inside of the lid is a rude Chinese representation of the musk hunters, some shooting the animal, others cutting out the musk-bag. On the paper, which envelopes each pod, are similar rude representations in blue or red ink.

Pod musk (*moschus in vesicis*) consists of roundish, or somewhat oval pods, which are generally broader at one end than at the other. The hairs are brownish yellow, or grayish, or whitish, bristle-like, and stiff; arranged in a concentric manner around the orifice of the sac. A careful examination will always discover the remains of the penis. The pods are about $2\frac{1}{2}$ inches long, and $1\frac{3}{4}$ inches broad. The weight of each pod, as well as of the contained musk, is very variable. I am indebted to Mr. Noakes, druggist, of Snow Hill, for the

following account of the weights of six pods, and of the grain musk obtained therefrom:

Pods of Musk.	*Weight.*	*Contents.*
1	℥vss.	Grain Musk, ℥xvj. grs. xv.
1	℥ivss.	
1	℥viij. grs. xxxvijss.	
1	℥ix. grs. xlvijss.	
1	℥v. grs. xx.	
1	℥iijss.	
Total. 6	℥xxxvij. grs. xv.	℥xvj. grs. xv.
Average, 1	℥vj. grs. xijss.	℥ij. grs. xliiss.

Grain musk (*moschus in granis; moschus ex vesicis*) is granular, unctuous to the feel, mixed with hairs, of a dark reddish-brown colour, a bitter aromatic taste, and a strong, remarkable, very persistent smell (*musky odour*). Its odour can scarcely be called peculiar, since it is common to several animals and vegetables. Thus, the musk-ox and the musk-cat evolve it. The submaxillary gland of the crocodile secretes an unctuous musky substance. Among plants, Erodium moschatum, Malva moschata, and Centaurea moschata, may be referred to as possessing a musky odour. When mixed with other scents, musk has the remarkable property of augmenting and improving their smell, without much imparting its own; hence it is extensively used by perfumers. A few drops of potash added to musk increases its odour, by setting free, it is supposed, ammonia.

2. Siberian, Russian, or Kabardine Musk (*Moschus sibiricus, rossicus* seu *cabardinus*). This is an inferior kind. The pods are said to be more oblong or oval than those of the China kind; the hairs longer and whiter. But I have examined large quantities of Siberian musk, the pods of which are not distinguishable from those of the China by any of these characters. The only invariable distinction I have observed is in the scent, which is remarkably different; it is much less powerful, and more nauseous and disagreeable, being somewhat empyreumatic. Geiger says, it is sometimes accompanied by an odour similar to that of the sweat of a horse. This kind of musk is imported in wooden boxes, and all the pods that I have examined were in a good state of preservation; but frequently, I am told, this is not the case.

Bucharian Musk (*Moschus bucharicus*) is described by some pharmacologists, but I have never met with it. The hairs are said to be yellowish or reddish-brown. The musk has a weak odour, and is of very inferior quality.

Adulteration.—The great sophisticators of musk are the Chinese. I have seen several *artificial* pods of musk which had been imported from Canton. T. W. C. Martius (*Lehrb. d. pharm. Zool.* S. 39, 1838) calls this artificial kind *Wampo Musk*, and says that, for some years past, it has been extensively introduced into commerce. The hairy portion of the sacs is formed of a piece of the skin of a musk animal, (readily distinguished by its remarkable hairs,) coarsely sown at the edges to a piece of membrane, which represents the smooth or hairless portion of the sacs. These pods are distinguished from the genuine ones by the following characters:—the absence of any aperture in the middle of the hairy coat; the hair not being arranged in a circular manner; and the absence of remains of the penis (found in every genuine musk sac). These false sacs, as well as the genuine ones, are sometimes enveloped in papers marked, "*Musk collected in Nankin by Jung-then-chung-chung-kee.*" The odour of the musk of the false sacs is ammoniacal.

Grain musk is sometimes imitated by dried blood, and perhaps by other substances. The fraud is to be detected by a careful examination of the appearance and odour of the particles, and by their chemical characters. An infusion of genuine musk gives *no* precipitate with a solution of bichloride of mercury, but does with tincture of nutgalls, and acetate of lead. By incineration genuine musk

leaves behind a grayish white ash, whereas blood yields a reddish one. *Artificial musk* is said to be prepared by rubbing in a mortar dried bullock's blood with caustic ammonia, and mixing the half-dried mass with genuine musk. Another kind of artificial musk has been already described (see vol. i. p. 373).

Commerce.—"At an average of the three years ending with 1832, the imports of musk, from all places eastward of the Cape of Good Hope, with the exception of China, amounted to 4,965 ounces a-year." (M'Culloch's *Dict. of Commerce.*) In 1839, duty (6d. per ounce) was paid on 2,389 ounces.

Composition.—In 1803, Thiemann (*Berl. Jahrb.* 1803, S. 100) analysed musk. In 1805, Bucholz (Pfaff, *Mat. Med.* Bd. iv. 401) examined it. In 1820, Blondeau and Guibourt (*Journ. de Pharm.* vi. 105) published an analysis of it. Afterwards, Westler, (Buchner's *Rep.* Bd. xvi. S. 222, 1824,) Buchner, (*Ibid.* Bd. xxii. S. 152, 1825,) and Geiger and Reinmann, (Gmelin, *Hand. d. Chem.* ii. 1449,) submitted it to chemical investigation.

Guibourt and Blondeau.

1. *Volatilized by drying* { Water	46·925
{ Ammonia	0·325
2. *Extracted by ether*—Stearine, oleine, cholesterine, fatty acid with ammonia, traces of a volatile oil	13·000
3. *Extracted subsequently by alcohol*—Cholesterine, fatty acid with ammonia, sal ammoniac, chlorides of potassium, sodium, and calcium, and an undetermined acid combined with the same bases	6·000
4. *Extracted subsequently by water*—Gelatine, carbonaceous matter soluble in water, the preceding chlorides, and an undetermined combustible acid	19·000
5. *Extracted subsequently by ammonia*—Albumen and phosphate of lime.	12·000
6. Fibrous tissue, carbonate and phosphate of lime, hairs, and sand	2·750
	100·000

Geiger and Reinmann.

1. Peculiar volatile substance.	Quantity undeterminable.
2. Ammonia	Ditto
3. Peculiar, fixed, uncrystallizable acid	Ditto
4. Stearine and oleine	1·1
5. Cholesterine (with some oleine and resin)	4·0
6. Peculiar bitter resin	5·0
7. Osmazome (with sal ammoniac, chlorides of sodium and calcium, and the above acid, partly free, partly combined with the bases)	7·5
8. A mouldy-like substance, in part combined with ammonia, by which it is made soluble in water, with small quantities of phosphates of lime and magnesia, sulphate of potash, chlorides of potassium and sodium, carbonate of potash or soda, and trace of iron	36·5
9. Sand	0·4
10. Water, some volatile odorous matter, the above acid in part combined with ammonia, and loss	45·5
	100·0

Odorous Principle.—Has not hitherto been isolated. The strong and diffusive odour of musk would lead us to expect that its odorous matter was highly volatile. Yet such is not the fact; for we cannot deprive musk of its peculiar odour by distillation, though the distilled liquid has a musky smell. As it is destructible by heat, it is obviously organic. It is not peculiar to musk, since many other substances exhale an analogous odour. Some have suggested that it is the result of putrefaction of one or more of the constituents of musk; and in support of this statement it is asserted that, by Leslie's method of desiccation, musk may be dried and rendered odourless. I have repeatedly performed this experiment with every care, but without obtaining odourless musk. Robiquet was of opinion that many odorous substances owed their odour to a certain quantity of ammonia, which, being disengaged, carried off with it substances not otherwise volatile, which masked the ammoniacal smell. In applying this hypothesis to musk, it must be admitted that it harmonizes well with several of the circumstances observed. Thus musk evolves ammonia; water distilled from musk contains ammonia; and potash added to a solution of musk heightens its odour (by facilitating the evolution of ammonia?)

Physiological Effects.—Musk disturbs the functions of the stomach, acts as a stimulant to the vascular system and brain, and afterwards proves narcotic. Jörg (*Material zu einer Argneimittell*, Leipzig, 1825; and *Lond. Med. Gaz.* vol. xxvi. p. 952) and his pupils submitted themselves to its influence in doses of from 2 to 15 grains in water or mixed with magnesia. Its primitive effects were eructation, weight at the stomach, diminution or increase of appetite, dryness of the œsophagus, heaviness of the head, vertigos, and headache. The secondary effects were more marked on the encephalon than on the digestive canal: disposition to sleep, faintness, and a feeling of heaviness in the whole body. Lastly, deep and long-continued sleep. In very large doses the action on the nervous system was very marked; trembling in the limbs, and even

convulsions, were observed. The pulse was increased in frequency, and somewhat fuller. These effects show that musk belongs to the cerebro-spinants (see vol. i. p. 177). It is a stimulant to the nervous and vascular systems, and an irritant to the stomach. Its effects are by no means uniform. Trousseau and Pidoux, (*Traité de Thérap.* t. i. p. 25,) suffered from its use neither excitement of the vascular system nor sleep. Its influence is more manifested in some constitutions (those, for example, commonly termed nervous, in whom there is a very sensible or excitable condition of the nervous system), than in others (as the phlegmatic). Moreover, its effects are more marked in some morbid conditions of the cerebral functions (of the hysterical kind), than in the healthy condition of these functions. In some persons the nervous system appears to be peculiarly susceptible of the odour of musk; for it is reported that headache, giddiness, and even fainting, have been induced by it. When the digestive apparatus is previously in a state of irritation, musk increases the local disorder, giving rise to pain, nausea, vomiting, and diarrhœa. Sometimes the stimulant influence of musk is directed to the sexual organs. Trousseau and Pidoux (*op. supra cit.*) experienced from it "une assez vive excitation des organes génitaux." In the female it has occasionally provoked the catamenial discharge. In persons disposed to epistaxis it has at times appeared to bring on the hemorrhage. Occasionally diaphoresis or diuresis has seemed to result from its use.

The odorous principle of musk is absorbed, and subsequently thrown out of the system by the excretories. Barbier (*Traité Elem. de Mat. Méd.* ii. 143, 2d ed. 1824) observes that the urine and the sweat of persons who have taken this substance are powerfully impregnated with its odour—now and then so strongly, that the hand, applied for the purpose of feeling the pulse, retains the odour for some time. On post-mortem examination, the brain, and the cavities of the chest and abdomen, in those who have taken it during life, sometimes emit a strong smell of musk. Tiedemann and Gmelin (*Vers. ü. d. Wege auf welch. Subst. ins Blut gelang.* S. 63, 69, 71, 73, 1820) recognised the odour of musk in the blood of the mesenteric, splenic, and portal veins; but they failed to detect it in the contents of the lacteals. Trousseau and Pidoux mention that in their experiments, the excretions acquired a feeble odour of musk. Jörg, however, denies that the excretions of those who have taken musk have the smell of this substance.

Uses.—The effects of musk, already alluded to, show that it is a remedy which will be useful where we want to excite the nervous system; and, *vice versâ*, that it will be hurtful where there exists a determination of blood to the brain, and in those constitutions denominated plethoric. The cases in which experience seems to have shown that musk is sometimes useful are the following:

1. Those diseases which are attended with convulsive movements, and which, therefore, are called *spasmodic*. Such, for example, as hysteria, epilepsy (especially of children, and where the disease does not depend on organic changes, or on plethora), chorea, and even in some cases of tetanus. The employment of musk here has led to its denomination of antispasmodic.

Dr. Cullen, (*Mat. Med.*) on whose practical information I place great reliance, says, "I maintain that musk (when genuine) is one of the most powerful antispasmodics that we are acquainted with. I have found it, with Dr. Wall, to be a powerful remedy in many convulsive and spasmodic affections, and in some of a very peculiar kind. I had once a gentleman affected with a spasm of the pharynx, preventing deglutition, and almost respiration. This, when other remedies had failed, was relieved by the use of musk, which often showed its power; for the disease continued to recur at times for some years after, and was only obviated or relieved by the use of musk."

2. In *low fevers* which are accompanied with delirium, twitchings of the muscles, a small contracted pulse, and convulsions, musk has been occasionally

employed, and with benefit. Like opium, its use in these cases is always uncertain—in one instance relieving, in another increasing the malady, though the cases may be to all appearances parallel.

3. In *retrocedent gout*, as where gout attacks the stomach or the head, giving rise to headache or delirium, musk has been found beneficial. Cullen relates a case where immediate relief was obtained by the exhibition of fifteen grains of genuine musk.

4. In the *delirium* which sometimes occurs in pneumonia, but which bears no relation to the intensity of the latter, and is accompanied with adynamia, Recamier (Jacquet, *Biblioth. Méd.* t. lix.) has found it beneficial.

5. Lastly, during the late severe visitation of *malignant cholera*, musk was one of the remedies tried. I saw it employed several times, but without obvious relief. The experience of others was various; but the result is, that the profession has formed a very low estimate of its power in this disease.

Administration.—Musk should be given in *substance*, either in the form of boluses, or suspended in water by means of saccharine or mucilaginous substances. Its dose is from eight to fifteen grains. In children it may be sometimes used in the form of enema.

1. MISTURA MOSCHI, L.; *Musk mixture.* (Musk; Gum Arabic, powdered; Sugar, of each ʒiij.; Rose Water, Oj. Rub the musk, with the sugar, then with the gum, the rose water being gradually added.)—One fluidounce of this mixture contains nine grains of musk. In practice it will be sometimes found convenient to employ twice as much gum, and half as much again of musk.—Dose, fʒj. to fʒij.

2. TINCTURA MOSCHI, D.; *Tincture of Musk.* (Musk in powder, ʒij.; Rectified Spirit, Oj. Digest for seven days, and filter.)—Principally valuable as a perfume. Each fʒj. is prepared with only gr. viijss. of musk; or each fʒj. with somewhat less than one grain. It is obvious, therefore, that a dose of the tincture which contains a medium dose of musk, would be dangerous, from the large quantity of alcohol it contains.

Essence of Musk, used as a perfume, is ordinarily prepared from the musk pods from which the grain musk has been extracted. The following formula has been furnished me, as one in common use:—Grain Musk, ʒxiv. (or Musk Pods, ʒvij.); Boiling Water, Oss. Digest until cold; then add, of Rectified Spirit, Ovjss.; Carbonate of Potash, ʒss. Digest.

2. CER'VUS EL'APHUS, *Linn. L. E.*—THE STAG.

(Cornu, *L.*—Horn, *E.*—Cornua Cervina Ramenta, *D.*)

History.—Both the hart and the hind (the male and female stag) are repeatedly mentioned in the Bible. (*Deut.* xiv. 5, and *Psalms* xviii. 33.) The stag is also noticed by Hippocrates, Aristotle, Pliny, Galen, and Avicenna.

Zoology.—**Gen. Char.**—*Incisors* $\frac{0}{8}$, *canines* $\frac{0}{0}$ — $\frac{0}{0}$, or $\frac{1}{0}$ — $\frac{1}{0}$, *molars* $\frac{6}{6}$ — $\frac{6}{6}$ = 32 or 34. *Canines*, when they exist, compressed and bent back. *Head* long, terminated by a muzzle. *Eyes* large, pupils elongated transversely. *A lachrymal sinus* in most. *Ears* large and pointed. *Tongue* soft. *Body* slender. Four inguinal *mammæ*. *Horns* solid, deciduous, palmated, branched, or simple, in the males; females, with one exception, without horns.

Sp. Char.—*Horns* with three anterior antlers, all curved upwards, the summit forming a crown of snags from a common centre. *Lachrymal sinuses.* *Fur* red-brown in summer, brown-gray in winter. *A pale disc* on the buttocks.

The stag usually begins to shed his antlers in February or March, immediately after which their reproduction begins, and by July he has completely renewed them. The first sensible phenomenon of the formation of these parts is the vascular excitement about the frontal bone. The arteries are observed to be enlarged, and to pulsate more strongly than usual; the heat is increased, and, in fact, all the symptoms of active inflammation come on. Very soon we perceive two cartilaginous tubercles, one on each side; these enlarge and elevate

the skin, by which they acquire, from the distention of the latter, a velvety covering. These tubercles are soon converted into real bone; but the deposit of ossific matter does not stop here: it continues around the base of the antlers, thus giving rise to what has been usually termed the *burr*. These osseous prominences, the antlers, are supplied with two sets of vessels—an external or cutaneous, which is the most efficient, and an internal. By the pressure made on the former by the burr, they are obliterated: the covering of the antlers no longer receiving a supply of blood, soon ceases to live, dries up, and falls off. The internal vessels continue to keep up the life of the bone for a few months longer, when death takes place. This occurrence may be in part owing to the imperfect nutrition, and partly, perhaps, to the exposure of the bone to the air without any envelope; but it arises principally from some unknown changes in the vital actions. The antlers being now dead, nature soon sets about their separation. To effect this, the living parts at the base are rapidly absorbed, so that the antlers being left but slightly adherent to the frontal bone, readily fall off by a gentle knock. A few hours only elapse before the irregularity on the surface of the os frontis is covered by a thin pellicle, and shortly afterwards the formation of a fresh pair of antlers is commenced. Castration stops the growth of the antlers.

Hab.—Europe, Asia, and North of Africa.

Description and Composition.—The antlers of the stag are commonly called *hartshorn* (*cornu cervi* vel *cornu cirvinum*). Though simply designated *cornu* (*horn*) in the London and Edinburgh Pharmacopœia, their composition is very different to that of the horns of the ox or the sheep, and which are sometimes called *true horn*. The latter consists principally of coagulated albumen; whereas hartshorn has the same composition as bone. According to Merat-Guillot (quoted by Berzelius, *Traité de Chim.* vii. 643) it consists of *soluble cartilage* (*gelatine*) 27·0, *phosphate of lime* 57·5, *carbonate of lime* 1·0, *water* and *loss* 14·5.

Hartshorn shavings or *raspings* (*rasura* vel *ramenta cornu cervi*) readily give out their gelatine by boiling in water.

Physiological Effects and Uses.—Decoction of hartshorn is nutritive, emollient, and demulcent. It does not possess any superiority over calf's foot or other gelatinous liquids. It has been used in intestinal and pulmonary irritation. It is generally taken flavoured with sugar, lemon, or orange juice, and a little wine.

Hartshorn shavings are directed to be used in the manufacture of *Antimonial Powder* (see vol. i. p. 551), but manufacturers generally substitute bone sawings.

Brewers and others sometimes employ decoction of hartshorn for fining beer and other liquors. It is preferable to isinglass on account of its cheapness. The gelatinous matter of bones being less soluble than that of antlers, bone sawings or shavings do not answer as a substitute for hartshorn.

CORNU USTUM, L. *Pulvis Cornu Cervini Usti*, D.; *Burnt Hartshorn*. (Burn pieces of horn in an open vessel until they become perfectly white; then powder and prepare them in the same manner as directed with respect to chalk.)—Burnt hartshorn is similar in its composition to bone-ash (see vol. i. p. 505). It has been used in the same cases, but its employment is now nearly obsolete. Its dose is ℈j. to ʒj.

3. OVIS ARIES, *Linn. L. E. D.*—THE SHEEP.

(Sevum, *L.*—Fat, *E.*—Adeps Ovillus, *D.*)
(Sevum, U. S. Suet.)

History.—The sheep is one of the anciently known animals. It is mentioned by Moses, (*Genesis* iv. 2,) by Herodotus, (*Thalia*, cxiii.) Aristotle, and other ancient writers.

Zoology. **Gen. Char.**—*Incisors* $\frac{0}{8}$, *canines* $\frac{0}{0}$—$\frac{0}{0}$, *molars* $\frac{6}{6}$—$\frac{6}{6}$ = 32. *Horns* common to both sexes, sometimes wanting in the female, thick, angular, wrinkled

transversely, pale coloured, turned laterally in a spiral form. *Ears* small. *Legs* slender. *Hair* of two kinds. *Tail* more or less short. Two *mammæ*.

Sp. Char. [*O. Musimon.*]—*Horns* very strong, arched backward, and curved downwards, and towards the point. General *colour* fawn, more or less brown, white on the face and legs, and under the belly; a darker streak on the dorsal line, on the flanks, and often black about the neck.

FIG. 273.

Ovis Ammon.

FIG. 274.

Ovis Musimon.

The immense number of races of this animal in cultivation are well known; and it is now difficult, perhaps impossible, to determine its native condition. Modern zoologists, however, ascribe our domesticated sheep to the *Ovis Ammon*, called the *Argali* of Siberia, or to *Ovis Musimon*, termed the *Mouflon* or *Muflon* of Sardinia.

Hab.—Domesticated every where.

DESCRIPTION.—Mutton suet (*sevum; sevum ovillum; adeps ovillus*) is the fat from the neighbourhood of the kidneys of the animals. It is prepared (*sevum præparatum*) by melting it over a slow fire, and straining through linen or flannel in order to separate the membranous portions.

COMPOSITION.—The *ultimate* analysis of mutton suet has been made by Chevreul and Bérard. (Gmelin, *Handb. d Chem.* ii. 439.) The first of these chemists also ascertained its *proximate* composition.

Ultimate Analyses.				*Proximate Analysis.*
	Chevreul.		*Bérard.*	
Carbon	78·996	....	65·0	Stearine, Elaine or Oleine } principally.
Hydrogen	11·700	....	21·5	Margarin, a little.
Oxygen	9·304	....	13·5	Hircin, a little.
Mutton Suet	100·000	....	100·0	Mutton Suet.

PHYSIOLOGICAL EFFECTS AND USES.—Like other fatty bodies, mutton suet is nutritious, but difficult of digestion. Its local effects are emollient and demulcent. In medicine it is used as a basis for ointments, cerates, and some plasters; being preferred, in some cases, to hog's lard, on account of its greater consistence.

4. BOS TAURUS, *Linnæus*.—THE OX.

(Lac.)

HISTORY.—An animal very anciently known and highly valued. It is repeatedly mentioned by Moses.

ZOOLOGY. **Gen. Char.**—*Incisors* $\frac{0}{8}$, *canines* $\frac{0}{0} - \frac{0}{0}$, *molars* $\frac{6}{6} - \frac{6}{6} = 32$. *Body* large. *Members* strong. *Head* large; forehead straight; muzzle square. *Eyes* large. *Ears* generally funnel-shaped. A fold of the skin, or *dew-lap* on

the under side of the neck. Four *mammæ;* tail long, tufted; horns simple, conical, round, with different inflections, but often directed laterally, and the points raised.

Sp. Char.—*Horns* round, lateral arched, with the point turned outwards. *Face* flat, or a little concave. *Occipital crest* in the same line as the base of the horns. *Mammæ* disposed in a square form. *Hair* fawn-coloured, brown or black, not sensibly longer at the anterior than the posterior parts. About seven feet long.

Mammary Glands two, placed close together, and constituting the *udder*. Each gland consists of a number of *lobes*, made up of *yellowish* or *reddish soft granules*, which consist of very fine blood-vessels, nerves, and the commencement of the *milk* or *lactiferous ducts* (*ductus galactophori*) which unite to form eight or ten principal ducts, which open into the *large duct*, or *duct of the teat*. This tube is conical, and has a number of folds on its internal surface.

Hab.—Domesticated every where.

Description.—Milk (*lac*), or, to be more precise in our description, *cow's milk* (*lac vaccinum*), is an opaque, white emulsive liquid, with a bland sweetish taste, a faint peculiar odour, and a sp. gr. of about 1·030: the latter property is subject to considerable variation. When recently drawn from the animal it is slightly alkaline. Subjected to a microscopical examination, milk is observed to consist of myriads of *globular particles* floating in a serous liquid. These globules are exceedingly minute: according to Raspail (*Chim. Organ.*) the diameter of the largest does not exceed in size the 0·0003937 (about 1·2500th of an inch). They instantly disappear by solution on the addition of a drop of caustic alkali. Both Donné (*Lond. Med. Gaz.* xxv. 302,) and Sir A. Cooper (*On the Anatomy of the Breast*, 1840,) have separated the globules by repeated filtration: the filtered liquid was transparent. The milk globules consist essentially of *butter*. Donné denies that they contain any caseum, since they are soluble both in alcohol and ether, which do not dissolve caseum. Being specifically lighter than the liquor in which they are suspended, they readily separate by standing. They, therefore, rise to the surface, carrying with them some caseum, and retaining some of the serum; thus forming what is called *cream*. The milk from which the cream is separated is termed *skimmed milk*.

Cream (*cremor lactis: flos lactis*) has a variable sp. gr. The average, perhaps, is 1·0244. The upper stratum of cream is richest in butter, the lowest in caseum. By agitation, as in the process termed *churning*, the fatty globules unite to form *butter* (*butyrum*); the residue, called *butter-milk* (*lac butyratum*), consists of caseum, serum, and a little butter.

Skimmed milk, like cream, has a variable sp. gr.; perhaps the average may be taken at 1·0348. If left to itself, it readily acquires acid properties, while white coagula, commonly termed *curds*, separate from it. If an acid or rennet (an infusion of the fourth stomach of the calf) be added to it, this change is immediately effected. The curd separated by rennet is called *caseum*. But after rennet has ceased to produce any more coagula, acetic acid will cause a further quantity to be formed. The curd thus separated by the acid is termed *zieger* or *serai*. The *whey* (*serum lactis*) left after the separation of the caseum and serai, yields, on evaporation, sugar of milk, one or more nitrogenous substances, lactic acid, and some salts.

Composition.—Milk has been the subject of repeated chemical investigation. (See Berzelius, *Traité de Chim.* vii. 583.) The recent analysis of several kinds of milk, published by MM. O. Henry and Chevalier, has been already stated (see vol. i. p. 85).

The following table shows the composition of several domestic preparations of milk.

				CONSTITUENTS.
MILK.	Cream	Butter	solid fat	1. *Stearine.*
			liquid fat	2. *Butyrine.* 3. *Oleine.*
		Butter-milk	caseum.	
			serum or whey.	
	Skim-milk	Matters coagulable	by rennet	4. *Caseum.*
			not by rennet, but by acetic acid,	5. *Zeiger* or *Serai.*
		Whey or serum	saccharine matter	6. *Sugar of Milk.*
			azotized matter	7. *Osmazome.*
			salt: soluble in alcohol	8. *Alkaline and earthy lactates & phosphates.*
			salt: soluble in water, not in alcohol	9. *Alkaline sulphate and phosphates.*
			salt: insoluble in water	10. *Earthy and ferruginous phosphates.*

1. CASEUM or *Casein; Albumen of milk; Lactalbumen.*—An albuminous substance distinguished from the albumen of the egg and of blood by its not coagulating when heated, and by the products of its spontaneous decomposition. When dried it is yellowish and transparent, like gum: it is odourless, and has a very slight taste. It is soluble in water. If its solution be boiled in contact with the air it becomes covered with a white pellicle insoluble in water. The acids unite to form with it, when they are in excess, insoluble compounds. Various salts (as sulphate of copper, bichloride of mercury, nitrate of silver, bichloride of tin, &c.) form insoluble compounds with it. Its composition has been already stated (see vol. i. p. 82).

2. BUTTER.—This well-known substance consists of three fatty bodies, *stearine*, *elaine* or *oleine*, and *butyrine*. The latter substance is characterized by yielding, by saponification, three volatile, odorous, fatty acids, viz. *butyric*, *capric*, and *caproic acids*. A small quantity of these acids exists in ordinary butter, especially when it has been exposed to the air, and gives butter its peculiar odour.[1]

3. SUGAR OF MILK; *Lactin; Saccholactin.*—Obtained from whey by evaporation. As used in commerce it occurs in cylindrical masses, in the axis of which is the cord which serves as the nucleus for the crystals. It is extensively made in Switzerland. M. Hess (*Journ. de Pharm.* xxiii. 498,) has shown that, under certain conditions, caseum is susceptible of fermentation, as was before inferred from the fact that the Tartars prepare a vinous liquid, called *Koumiss*, (*Travels in various Countries of Europe*, vol. i. p. 238, Lond, 1810,) from mares' milk. It is gritty under the teeth, and is very slightly soluble in alcohol. It is much less sweet, and less soluble in water, than common sugar. By the action of nitric acid it yields, like gum (see p. 571), saccholactic or mucic acid; so that it forms, as it were, a connecting link between sugar and gum. The composition of it, according to Prout, has been already (see vol. i. p. 77) stated. The formula of crystallized sugar of milk is $C^{24}\ H^{19}\ O^{19}+5$ aq.

4. LACTIC ACID.—This, though stated by Berzelius to be a constituent of milk, is probably a product of its decomposition.

5. SALTS.—Some of these are soluble in alcohol, as the lactates of potash (principally), soda, ammonia, lime, and magnesia; others are soluble in water, but not in alcohol, as sulphate of potash and the phosphate of potash and soda; lastly, the salts insoluble in water are the phosphates of lime, magnesia und iron. The latter are held in solution in milk by the caseum principally. Berzelius says by the lactic acid also.

CHARACTERISTICS OF GOOD MILK.—The changes produced in the quality of milk by diseased conditions of the cows has recently attracted considerable attention in Paris, owing to the prevalence of a malady called the *cocote*, among the cows in that capital. (See *Journ. de Pharm.* vol. xxv. p. 301-318.) The following are the essential morbid changes which have been recognised in milk: want of homogeneousness, imperfect mobility or liquidity, capability of becoming thick or viscid on the addition of ammonia, and presenting, when examined by the microscope, certain globules (agglutinated, tuberculated, or mulberry-like, mucous or pus globules) not found in healthy milk.[2] Hence, then, good milk should be quite liquid and homogeneous; not viscid; and should contain only spherical transparent globules, soluble in alkalis and ether; should not become thick when mixed with ammonia; and should form a flocculent precipitate with acetic acid, but not be coagulated by heat. The relative

[1] For some remarks on the physical and microscopical characters of butter, by Turpin, see *Journ. de Chim. Méd.* t. vi. 2nde Sér. p. 117.

[2] *Recherches microscopiques sur divers laits obtenus de vaches plus ou moins affectées de la Maladie qui a régné pendant l'Hiver de* 1838 à 1839, *et designée vulgairement sous la dénomination de Cocote*, par M. Turpin, in the *Mémoires de l'Académie Royale des Sciences de l'Institut*, t. xvii. Paris, 1840.

quantity of cream afforded by milk is estimated by a graduated glass tube, called a *lactometer*.

I have repeatedly submitted the milk supplied to me by a respectable dealer in this metropolis, to examination by the lactometer, but the results have been most unsatisfactory, as the quantity of cream which I procured varied from 5 to 23 per cent. by measure. I have usually found the afternoon's milk to yield less cream than the milk supplied me in the morning. On one occasion I found 11·5 per cent. of cream in the morning milk, but only 5 per cent. in the afternoon milk.

Physiological Effects.—The dietetical properties of milk have been already considered (see vol. i. p. 85). As a medicinal agent it is regarded as a demulcent and emollient.

Uses.—The *dietetical* uses of milk have been already noticed (see vol. i. p. 85).

As a *demulcent* milk is an exceedingly valuable substance in irritation of the pulmonary and digestive organs. It is an excellent sheathing agent in poisoning by caustic and acrid substances, and in some of these cases it acts as a chemical antidote; for example, in poisoning by bichloride of mercury, sulphate of copper, bichloride of tin, the mineral acids, &c. Milk is further employed on account of its demulcent qualities in the preparation of the bread and milk poultice, which requires to be frequently renewed on account of the facility with which it undergoes decomposition, and acquires acrid qualities.

Milk is a constituent of the *Mistura Scammonii*, E. (See p. 383.)

Whey is an excellent diluent and nutritive. *Wine whey* (*serum lactis vinosum*) taken warm, and combined with a sudorific regimen, acts powerfully on the skin, and is a valuable domestic remedy in slight colds and febrile disorders. I have already referred to the uses of *cream of tartar whey* (see vol. i. p. 450), *alum whey* (see vol. i. p. 519,) and *tamarind whey* (see p. 518).

1. LACTIC ACID. $C^6\ H^5\ O^5 + Aq$. This acid has been introduced into medicine by Magendie. (*Formulaire pour la préparation et l'emploi de plusieurs nouveaux Medicaments*, Paris, 1835.) As it is one of the constituents of the gastric juice he proposed its use in dyspepsia, and as it is a ready solvent of phosphate of lime he suggested its employment in phosphatic deposits in the urine. An Italian physician (*Brit. and For. Med. Review*, vol. ix. p. 239) has more recently recommended it in gout, in consequence of its being a special solvent of the phosphate of lime. It has been exhibited in the form of lozenges, or in solution in water flavoured with sugar.

2. OX BILE (*Fel Bovinum* seu *Tauri*). Formerly extract of ox bile (*fel tauri inspissatum*) was employed in medicine as a tonic. It consists of *biliary matter*, *mucus*, *alimentary extract*, *chloride of sodium*, *lactate* and *phosphate of soda*, and *phosphate of lime*. The dose of it is a few grains in the form of pills.

Order III.—PACHYDERMATA, *Cuv.*—THE PACHYDERMS.

Essential Characters.—Three kinds of *teeth*. Four *extremities*, with the toes variable in number, and furnished with strong *nails* or *hoofs*. No *clavicles*. *Organs of digestion* not disposed for ruminating.

SUS SCRO'FA, *Linn.* L. E. D. — THE HOG.

(Adeps præparatus, *L.*—Fat, *E.*—Adeps ovillus, *D.*)

(Adeps, U. S. Lard.)

History.—The hog is an animal very anciently known. By the Levitical law the Jews were forbidden to eat its flesh (*Levit.* xi. 7); on account of either the filthy habits of the animal, or its supposed tendency to engender skin and other diseases, more especially leprosy. The Mahometans are also interdicted from eating it.

Zoology. **Gen. Char.**—*Incisors*, $\frac{4}{8}$ or $\frac{6}{6}$; *canines*, $\frac{1}{1} - \frac{1}{1}$; *molars*, $\frac{7}{7} - \frac{7}{7}$; = 42 or 44. *Canines* bent upwards and laterally; *molars* tuberculous; lower *incisors* bent forwards. Four *toes* on all the feet, the two middle ones only touching the ground, armed with strong *hoofs*. *Nose* elongated, cartilaginous. *Body* covered with bristles. Twelve *teats*.

Sp. Char.—*Tusks* strong, triangular, directed laterally. No *protuberance* under the eyes. *Colour* blackish-gray in the wild animal, but varying much in the domesticated races.

The varieties of this animal are almost innumerable. They are most conveniently reduced to the following:

α. *S. Scrofa ferus.* The *wild hog*, or *wild boar*.

β. *S. Scrofa domesticus.* The *domesticated hog*, which varies in its form and colour.

δ. *S. Scrofa pedibus monungulis.* The hog with solid and undivided hoofs. This variety was noticed by Aristotle and Pliny.

Hab.—The temperate parts of Europe and Asia; the northern parts of Africa; America; the Islands of the South Sea, &c.

Preparation.—The fat of the animal is employed in medicine. That about the loins being firmer and denser than the fat of the other parts of the animal, is selected for medicinal use. In order to separate it from the membranes in which it is contained, it is melted over a slow fire, then strained through flannel or linen, and poured while liquid into a bladder, where it solidifies by cooling (*adeps præparatus*). Occasionally salt is added to preserve it; but unsalted lard should be employed for medical purposes. By melting in boiling water, lard may be deprived of any salt which may have been mixed with it. While solidifying, lard should be kept stirred, to prevent the separation of stearine and elaine.

Properties.—*Hog's lard* (*adeps suillus* vel *porci*) or *axunge* (*axungia*, so called from the use anciently made of it, namely, greasing the axle of a wheel,—*unguendi axem*) is at ordinary temperatures a white or yellowish white solid. Its melting point varies from 78·5° F. to 87·5° F. In the liquid state it should be perfectly clear and transparent; but if it be intermixed with water it has a whitish or milky appearance. It should have little or no taste or odour. By exposure to the air, however, it acquires an unpleasant odour and acid properties. In this state it is said to be *rancid*. This condition is induced by the oxygen of the air, part of which is absorbed, while a small portion of carbonic acid is evolved. As stearine does not become rancid in the air, while elaine does, the rancidity of lard is referred to the latter constituent. But it has been found that the purer the elaine the less readily does this change occur; whence it is assumed that some foreign substance in the elaine is the primary cause of rancidity, either by undergoing decomposition or by acting on the elaine.

Composition.—The *ultimate* composition of lard was ascertained by Chevreul, (Gmelin, *Handb. d. Chem.* ii.) as well as by Saussure and Berard. The first of these chemists also made a *proximate* analysis of rancid lard; and Braconnot determined the composition of fresh lard.

Ultimate Analysis.

	Chevreul.
Carbon	79·098
Hydrogen	11·146
Oxygen	9·756
Lard	100·000

Proximate Analysis of Fresh Lard.

	Braconnot.
Stearine, Margarine	38
Elaine or Oleine	62
Lard	100

Proximate Analysis of Rancid Lard.

Chevreul.

Stearine and Elaine.
Volatile non-acid matter having a rancid odour.
Caproic (?) acid.
Another volatile acid.
Oleic, margaric, and perhaps stearic acids.
Yellow colouring matter.
Non-acid, non-volatile matter, soluble in water.

Rancid lard.

Physiological Effects.—Lard, like other animal fats, is nutritious, but very difficult of digestion. Its topical effects are demulcent and emollient. Both the flesh and fat of the hog have been long supposed to dispose to cutaneous disease; but it is no easy matter to prove or disprove this opinion.

Uses.—In medicine lard is principally employed as a basis for unguents. It has been used, by friction, as an emollient; but the practice is now obsolete.

In pauper establishments it is sometimes employed, as a substitute for spermaceti ointment, to dress blisters; but the salt which lard sometimes contains, as well as the facility with which this fat becomes rancid, are objections to its use. I have seen it occasion considerable irritation.

Order IV.—RODENTIA, *Cuvier*.—THE RODENTS.

Glires, *Linnæus*.

Essential Characters.—Two large *incisors* in each jaw, separated from the molars by a vacant space. No *canine teeth*. *Molars* with flat crowns or blunt tubercles. *Extremities*, the posterior longest, terminated by unguiculated *toes*, the number varying according to the species. *Mammæ* variable in number. *Stomach* empty. *Intestines* very long.

CAS'TOR FI'BER, *Linn.* L. E. D.—THE BEAVER.

(Concretum in folliculis præputii repertum, *L.*—A peculiar secretion from the præputial follicles, *E.*—Castoreum, *D.* [U. S.])

History.—Castoreum was employed in medicine by Hippocrates, who considered it to possess the power of acting on the uterus. It was an ancient opinion that the castor sacs were testicles, and that when closely pursued by the hunter, the animal tore them off, leaving them behind as a ransom. (Juvenal, *Sat.* xii. v. 34.) Hence, it is said, arose the name of the animal, *à castrando*. This absurd notion seems to have been long ago disbelieved; for Pliny (*Hist. Nat.* lib. xxxii. cap. 13, ed. Valp.) tells us that Sextius derided it, and said it was impossible the animal could bite them off, since they were fastened to the spine. Thus was one error confuted by another; the truth being, the testicles are so placed in the inguinal region, on the external and latter part of the *os pubis*, that they are not discernible until the skin be removed. Moreover, female beavers also have castor sacs.

Zoology. **Gen. Char.**—Incisors $\frac{2}{2}$, canines $\frac{0}{0}$—$\frac{0}{0}$, molars $\frac{4}{4}$—$\frac{4}{4}$ = 20. *Molars* composed of flat crowns, with sinuous and complicated ridges of enamel. Five *toes* on each foot, the anterior short and close, the posterior longer and palmated. *Tail* broad, thick, flattened horizontally, of an oval form, naked, and covered with scales (Stark).

Sp. Char.—*Fur* consisting of two sorts of hair, one coarse and brownish, the other downy, more or less gray. About two feet long.

The ordinary *colour* of the animal is brown; but yellow, black, and spotted, and white beavers, are met with. The two latter are very rare. Richardson (*Fauna Boreali-Americana*,) has never seen either of them, though he has met with black beavers which were kept as curiosities. The *tail* is remarkable for its scaly appearance. Its great breadth (oftentimes five inches) depends not on the width of the caudal vertebræ, but on numerous strong tendons inserted on these vertebræ. *Incisor teeth* smooth, orange-coloured anteriorly, white posteriorly.

Fig. 275.

Castor Fiber.

There is some reason for supposing that the European and American beavers are distinct species.[1] The former are *burrowers*, the latter are for the most part *builders*.

Anatomy of the Castor Sacs.—It has been before stated, that both male and female beavers are furnished with castor sacs: hence it will be convenient to consider them in the two sexes separately.

1. OF THE MALE CASTOR SAC.—If the animal be placed on his back, we observe, near the tail, a hollow (called by some a *cloaca*) inclosed by a large wrinkled, somewhat hairy, cutaneous protuberance, which according to Perrault (*Mem. for a Nat. Hist. of Animals*, p. 85,

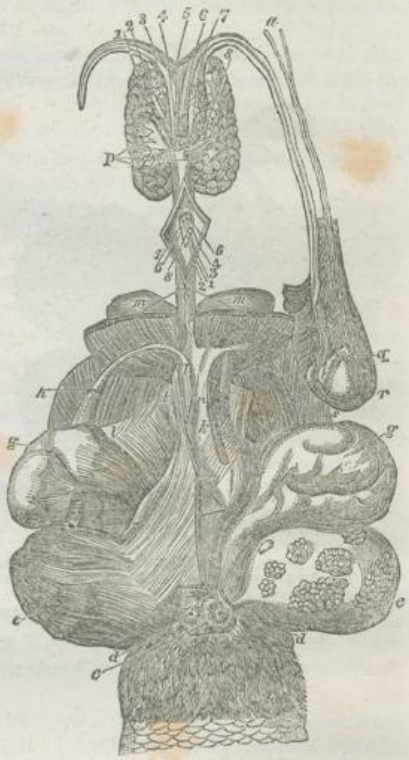
[1] See some remarks on the distinctions between the burrowing and building beavers, in *Jameson's Journ.*, vol. xxviii. p. 68.

Lond. 1701,) is easily contracted and dilated, not by a sphincter, as the anus, but simply like a slit. In this hollow the anus, the prepuce, and the oil sacs open.

When the skin of the abdomen is removed, four eminences, covered by their appropriate muscles are brought into view. They are placed between the pubic arch and the so-called cloaca. The two nearest the pubes are the *castor sacs*, while those next the cloaca are the *oil sacs*. Between the two castor sacs, in the male, lies the *penis* with its bone (*os penis*); it is lodged in a long *preputial canal*, which terminates in the cloaca, and has some analogy to a vagina; so that there is some difficulty to determine, until the skin be removed, whether the individual be male or female.

The penis points towards the tail, not towards the navel, as in the dog. Its surface is covered with longitudinal wrinkles and pits: in each of the latter is found a dark-coloured warty-like body. The *testicles*, *vasa deferentia*, and *vesiculæ seminales*, present nothing remarkable. There is no *scrotum*. Like most other Rodentia, the beaver has *vesiculæ accessoriæ*, or blind ducts, which open into the urethra near its commencement. Just at the point where the urethra joins the penis are observed *Cowper's glands*. The *castor sacs* open by a common aperture into the preputial canal. This aperture is about one inch in width, and is placed opposite the extremity of the *glans penis* in the relaxed condition of the organ, and about one inch from the orifice of the prepuce. Between this common orifice of the castor sacs and the glans penis is a semilunar fold. There is also a second, similar, but thicker, fold covering the rectum. The *castor sacs* are pyriform and compressed. They communicate with each other at their cervical portion; but their fundi diverge outwards and towards the pubes. Each castor sac is composed of an *external* or *cellular* coat which incloses *muscular fibres*. The latter are a continuation of the panniculus carnosus: their function appears to be to compress the sac. Within these fibres lies a very *vascular coat*, which covers the scaly or glandular coat, and sends processes in between the convolutions of the latter. The *scaly* or *glandular coat* forms numerous folds or convolutions, which are largest and most numerous in the fundus of the sac. Externally, it is shining, silvery, and iridescent. Internally, it presents numerous, small, lanceolate, oblong, or semilunar scales, which are mostly toothed at their margin, and envelope each a *brown body*, supposed to be a gland, and which is lodged in a small cavity. The inner surface of the castor sacs is lined with *epithelium* (a continuation of the epithelium of the prepuce), which invest the glands and scales of the scaly or glandular coat. In the cavity of the castor sac is found the *castoreum*, which, when recent, is thin, fluid, highly odorous, yellow or orange coloured, becoming deeper by exposure to the air. The quantity of this secretion is liable to great variation. The *oil sacs* are conglomerate glands, placed one on each side between the castor sac and anus: their ducts terminate in the cloaca. The secretion of these sacs is a fatty matter, having the consistence of syrup or honey, a peculiar odour, and a yellowish colour. It was formerly used in medicine under the name of *pinguedo* seu *axungia castoris*.[1]

FIG. 276.



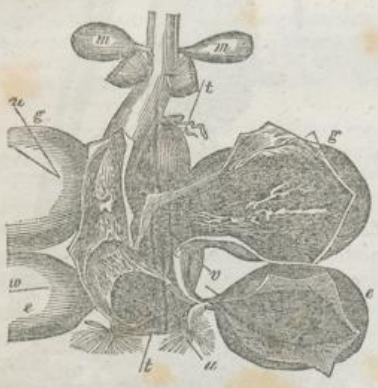
Castor and oil sacs, with their appropriate muscles.

a, Spermatic vessels.
c, Anus.
d d, Openings of the anal glands.
e e, Anal glands.
g g, Castor sacs.
h, *i*, *l l*, *n*, Compressor muscles of the castor sacs and anal glands.
k. Penis.
m, *m*, Cowper's glands.
o, Urethra cut off.
p, Lobes of the prostate gland.
r, Testicle.
The figures refer to the probes passing from the caput gallinaginis to the vesiculæ seminales and vasa deferentia.

[1] For further details respecting the structure of the castor sacs consult Brandt and Ratzeburg, *Med. Zool.* i.

The relative position of the castor and oil sacs, with respect to the pelvis of the animals, is shown in fig. 279, taken from Perrault. (*Op. supra cit.*)

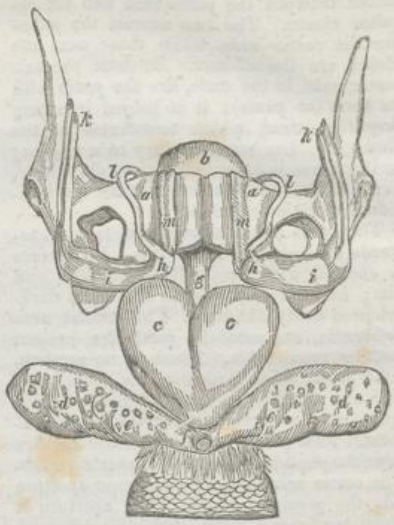
FIG. 278.



Castor and oil sacs laid open.

e e, Anal glands.
g g, Castor sacs.
m m, Cowper's glands.
t t, Probe passing into the rectum beneath a semilunar fold which separates the common aperture of the castor sacs from the penis.
u u and *v v*, Two probes passing into the right castor sac, behind a second semilunar fold.

FIG. 279.



Relative position of the castor and oil sacs and pelvis.

a a, Os pubis.
b, Bladder.
c c, Castor sacs.
d d, Oil sacs.
f, The false cloaca.
g, The commencement of the penis.
h h, The epididymides.
i i, The testicles.
k k, The spermatic cord.
l l, The vasa deferentia.
m m, The cremaster muscles.

2. OF THE FEMALE CASTOR SAC.—We are less perfectly acquainted with the anatomy of the female than of the male beaver. Indeed I am acquainted with three dissections only of the former; viz. one by Gottwaldt, a second by Hegse, (both referred to by Ratzeburg, *op. supra cit.*,) and a third by Mortimer. (*Phil. Trans.* vol. xxxviii. 1735.) The subjoined description is from the memoir of the last-mentioned authority.

He says the animal had two *ovaria*, and an *uterus* dividing into two horns (uterus bicornis) as in the bitch. The *bladder* lay exactly over the body of the uterus. The *meatus urinarius* ran upon the *vagina* above two inches in length. Just below the *os pubis*, on each side of the vagina, above the meatus urinarius (supposing the animal laid on her back), a pair of *pyriform bags* were found, about $1\frac{3}{4}$ inches long, and 1 inch broad, diverging at their fundi or broad ends, but approximating most closely at their necks or narrow extremities, which were canals communicating with the adjoining glands. The membranes which formed these bags were tough, wrinkled, and furrowed, of a livid dirty colour. They were hollow, and capable of containing about an ounce of water. Upon opening them a small quantity of dark brown liquor, like tar, was found, having an odour like castoreum, and in addition a smell of ammonia. It is probable that the emptiness of the sacs, and the unusual quality of their contents, arose from the youth of the animal. About an inch lower, on each side of the vagina, were a pair of *glands*, (*oil sacs*), each about $1\frac{1}{2}$ inches long, and $\frac{1}{2}$ inch broad. Their form was oblong but irregular, and having several protuberances externally; their colour was pale flesh, like the pancreas. They seemed to communicate with the castor sacs, the sac and gland on each side opening externally, by one common orifice, around which were long black hairs.

HAB.—North America, from 67° or 68° to about 33° north latitude: Europe, from 67° to 36° north latitude, but becoming very scarce. It appears to have been indigenous.

CAPTURE OF THE BEAVER.—The beavers are caught in various ways;

sometimes in traps, sometimes in nets. But the usual method is to break up the beaver houses when the animals retreat to their bank holes, where they are easily taken.

Commerce.—Castoreum is imported from North America by the Hudson's Bay Company. The greater part of that brought over is sold for exportation. In 1839 duty (6d. per lb.) was paid on 801 lbs.

Description.—Two kinds of castor (*castoreum*) have long been known, viz. Russian and American. The latter, however, is the only one now met with in English commerce.

1. **American Castor** (*Castoreum Americanum.*)—It usually consists of two isolated sacs, frequently wrinkled, and which are connected so as to form two parts, like a purse, or like two testicles connected by the spermatic cords. The size of the sacs is liable to considerable variation. They are elongated and pyriform. The penis or the oil sacs, or both, are sometimes attached to them. The colour and other external characters are variable. In December, 1834, I examined between three and four thousand pounds of castoreum, which was offered for sale by the Hudson's Bay Company. A considerable quantity of it was covered externally with a bluish white mouldiness, while the remainder was of a brownish colour. The brown colour, however, varies considerably; sometimes being dark, in some cases yellowish, or even reddish. Some castor sacs are found nearly empty, and present, in their dried state, a very fibrous character: these are of inferior quality. Others are found gorged with unctuous matter, and, when quite dry, break with a resinous character, presenting no fibres until they have been macerated in spirit of wine. In many well-filled sacs the castoreum is quite soft.

In English commerce, two varieties of American castoreum are made: one called the *Hudson's Bay*, the other the *Canadian*. Both are imported by the Hudson's Bay Company. The *Hudson's Bay castoreum* is usually considered the finest variety. The specimens of it which I examined at the house of the Company, in December, 1834, came from York Fort and Moose River. The finest samples were superior to any of the Canadian kind, though the average quality was much the same.

2. **Russian Castor** (*Castoreum Rossicum*).—This is exceedingly scarce. When met with it fetches a very high price. I have paid for a museum sample £2 per oz., while American castor fetched only twenty shillings per lb. There are at least three kinds of castor sold as Russian. *Chalky Russian Castor* occurs in smaller and more rounded sacs than the American kind. (See *Lond. Med. Gaz.* vol. xvii. p. 296, fig. 41.) A pair of sacs in my museum weighs 557 grains. The specimens which I have seen had neither penis nor oil sacs attached. The colour is ash-brown. Its odour is peculiar, empyreumatic, and readily distinguishable from that of the American kind. Under the teeth it breaks down like starch, has at first little taste, then becomes bitter and aromatic. It is readily distinguished from all other kinds by dropping it into diluted hydrochloric acid, when it effervesces like a lump of marble. I have seen another kind of castor from Russia which may be termed *Resinous Russian Castor*. The sacs were large, well filled with resin, did not effervesce with hydrochloric acid, and had an odour very similar to that of American castor. The *Russian castor described by Guibourt* (*Journ. de Chim. Méd.* t. viii. p. 602) appears to have been subjected to some preparation. (See *Lond. Med. Gaz.* vol. xvii. p. 297, fig. 42.)

Composition.—Castoreum has been subjected to chemical analysis by several chemists. Those whose results deserve especial reference are Bonn (quoted by Gmelin, *Handb. d. Chem.* ii. 1449) and Brandes. (Ibid.)

Brandes's Analyses.

Volatile oil	1·00	Volatile oil	2·0
Resin	13·85	Resin	58·6
Castorin	0·33	Cholesterine	1·2
Albumen	0·05	Castorin	2·5
Osmazome	6·20	Albumen	1·6
Carbonate of lime	33·62	Gelatine	10·4
Other salts	2·82	Osmazome	2·4
Mucus	2·30	Matter soluble in alcohol	1·6
Animal matter like horn	2·30	Carbonate of lime	2·6
Membrane	20·00	Other salts	2·4
Moisture and loss	22·83	Membrane	3·0
		Moisture and loss	11·7
Canadian Castor	99·30	Russian Castor	100·0

These analyses do not agree with my experiments and observations. The quantity of carbonate of lime assigned to Canadian castor is much too large. By incinerating 60 grains of American castor in a platinum crucible I found only 1·2 grains of ashes, which if the whole were lime would be equal to little more than 3·57 per cent. of chalk.

1. Volatile Oil of Castoreum.—This is obtained by distilling the same water several times with fresh portions of castor. It is pale yellow, and has the odour of castor, with an acrid bitter taste. Bonn says he obtained 34 per cent. of oil, but there must be some error in this statement.

2. Castorine; *Castoreum Camphor*, Gmelin.—A crystalline, fatty, non-saponifiable substance. It is fusible, and in the liquid state floats on water. When pure it is quite white. It is soluble in ether and boiling alcohol. By long ebullition with nitric acid, it is converted into a yellow crystallizable acid, called *castoric acid*. The super-castorate of ammonia is crystallizable, and forms white precipitates with the salts of silver, lead, and protoxide of iron, and green precipitates with the salts of copper. Castorine is obtained by boiling castor in alcohol; the castorine deposits when the liquor cools. Scarcely any can be got from American castor.

3. Resin.—This is dark brown, has an acrid and bitter taste, and a slight odour of castor. It is insoluble in pure ether, but dissolves readily in alcohol. Water precipitates it from its alcoholic solution.

Physiological Effects.—Castor is usually denominated a stimulant and antispasmodic. Since the time of Hippocrates it has been regarded as endowed with a specific influence over the uterus.

In 1768, Mr. Alexander (*Experiment. Essays*, p. 83) took it in various doses to the extent of two drachms; and the only effect he experienced from it was disagreeable eructations. In 1824, Jörg and his pupils, males and females, (*Material. zu einer kunft. Arzneimittell.* Leipsig, 1824; *Lond. Med. Gaz.* vol. xxvi. p. 952,) submitted themselves to its influence; but the only effects were a slight uneasiness in the epigastric region, and disagreeable eructations having the odour of castor, and which were not allayed by breakfast or dinner, and only ceased at night when sleep came on.

These facts seem to show that castoreum possesses but little medicinal power: yet Dr. Cullen (*Mat. Med.*) declares that on many occasions it is certainly a very powerful antispasmodic. Its odorous particles become absorbed, for they have been recognised in the urine by their smell.

Uses.—Castoreum was formerly in great repute in those affections of the nervous system denominated *spasmodic*, such as hysteria, epilepsy, and catalepsy, more especially when these diseases occurred in females, and were attended with uterine disorder. In those kinds of fever called *nervous*, this medicine has also been recommended. In the northern parts of Europe it is used for its supposed *uterine influence*, as, to promote the lochial discharge, and the expulsion of retained placentæ. It is, however, little employed here, partly, perhaps, in consequence of its disagreeable taste and smell, its variable quality, and its high price; but, for the most part, I believe, because practitioners consider it an almost inert remedy.

Administration.—It is best given in substance, either reduced to powder or in the form of pills. The dose should be at least ʒij.

1. TINCTURA CASTOREI, L. E. (U. S.); *Tinctura Castorei Rossici*, D. *Tincture of Castor*. (Castor [Russian, *D.*], bruised, ʒijss. [ʒij. *D.* (U. S.)]; Rectified Spirit, Oij. [Proof Spirit, Oij. *wine-measure*, *D.*]; (U. S.) Alcohol, Oij.

Macerate for fourteen [seven, *D.*] days, and filter. "This tincture may be prepared either by digestion or percolation, like the tincture of Cassia." [p. 243], *E.*)—Rectified spirit, used by the London and Edinburgh Colleges, is a better solvent for castor than proof spirit, employed by the Dublin College. The quantity of castor used in all the processes is much too small. A fluid-ounce of the Edinburgh tincture contains three-fourths of a drachm, while the London preparation contains only half a drachm; so that to give a medium dose of castor (℥j.), it would be necessary to administer f℥ij. of the tincture (rectified spirit) of the London Pharmacopœia! Dr. Paris (*Pharmacol.*) says the dose of this tincture is ♏xx. to f℥ij.

2. TINCTURA CASTOREI AMMONIATA, E.; *Ammoniated Tincture of Castor.* (Castor, bruised, ℥iiss.; Asafœtida, in small fragments, ℥x.; Spirit of Ammonia, Oij. Digest for seven days in a well-closed vessel; strain and express strongly the residuum; and filter the liquor. This tincture cannot be so conveniently prepared by the method of percolation, *E.*)—Stimulant and antispasmodic. Spirit of Ammonia is a good solvent for both castor and asafœtida.—Dose f℥ss. to f℥ij.