the list of the materia medica of the Dublin Pharmacopœia, but for what reason I cannot understand, since it is never used in medicine. The bluish white precipitate obtained by adding a solution of the neutral acetate of copper to a solution of albumen, consists of *albumen* 90·81, and *deuto-acetate of copper* 9·19. It is soluble in excess of solution of either acetate of copper or of albumen. (Lassaigne, *Journ. de Chim. Med.* t. vi. 11e Sér. p. 305.)

Order XXIII.—BISMUTH AND ITS COMPOUNDS.

1. BISMU'THUM, *L. E. D.* (U. S.)—BISMUTH.

History.—This metal is first mentioned by Agricola, in 1529. It has been termed *Marcasita*, *Tectum Argenti*, or, by the Germans, *Wismuth*. "The old miners called it Wismuth," says Matthesius, "because it blooms as a beautiful meadow, (*Wiesematte*,) on which variegated flowers of all kinds are glittering." (Schwartze, *Pharm. Tabellen.*)

Natural History.—Bismuth occurs only in the mineral kingdom. It is found in Cornwall, Saxony, Bohemia, &c. It is met with in the metallic state nearly pure, (*Native Bismuth*,) and in combination with sulphur and with oxygen.

Preparation.—It is chiefly obtained from native bismuth by melting the metal out of its gangue.

Properties.—It is a reddish white metal, without taste or smell, composed of brilliant broad plates, and readily crystallizable in cubes or regular octohedrons. Its sp. gr. is 9·83 to 9·88. It is moderately hard, brittle, pulverizable, fusible at 476° F. When strongly heated in the air it takes fire, and burns with a faint blue flame, emitting a yellow smoke (the oxide.) In close vessels it may be volatilized. Its equivalent is 72.

Characteristics.—It is distinguished by its brittleness (see p. 648,) its ready fusibility, its solubility in nitric acid, and by the characters of the nitric solution, which throws down a white precipitate on the addition of water, and a black one when hydrosulphuric acid or the hydrosulphates are added to it.

Purity.—Copper may be detected by precipitating the nitric solution with ammonia; the supernatant liquor is blue if copper be present.

It is dissolved by diluted nitric acid; when subnitrate of bismuth is precipated from this solution by ammonia, the liquor is free from colour. Its specific gravity is 9·8. *Ph. Lond.*

Its powder is entirely soluble in nitric acid with the aid of heat; and the solution is colourless or nearly so, and deposites a white powder when much diluted with cold water. *Ph. Ed.*

Physiological Effects and Uses.—In the metallic state, bismuth is inert. Its only use is in the preparation of the trisnitrate.

2. BISMU'THI TRISNI'TRAS, *L.*—TRISNITRATE OF BISMUTH.

(Bismuthum album, *E.*—Bismuthi Subnitras, *D.*)—[U. S.]

History.—This compound was first prepared by Lemery. It has had various appellations, such as *Pearl White*, *Magistery of Bismuth* (also a name for submuriate of bismuth,) *Spanish White*, *Sub-nitrate* or *Tetarto-nitrate of bismuth.*

Preparation.—All the British Colleges give directions for the preparation of this salt.

The *London College* orders of Bismuth, ℥j.; Nitric Acid, f℥iss.; Distilled Water, Oiij. Mix a fluid ounce of the water with the Nitric acid, and dissolve the Bismuth in them; then pour off the solution. To this add the rest of the water, and set by that the powder may subside. Afterwards, the supernatant liquor being poured off, wash the Trisnitrate of Bismuth with distilled water, and dry it with a gentle heat. [This is essentially the direction of the U. S. Phar.]

The process of the *Edinburgh College* is essentially similar. The precipitate [the Trisni-

trate] is directed to be collected on a calico filter, washed quickly with distilled water, and dried in a dark place.

The *Dublin College* directs it to be prepared with Bismuth reduced to powder, *seven parts*; Diluted Nitric Acid, *twenty parts*; Distilled Water, *one hundred parts*.

In the first part of this process we obtain a nitrate of bismuth by the re-action of three equivalents or 216 parts of bismuth, on four equivalents or 216 parts of nitric acid. One equivalent or 30 parts of binoxide of nitrogen are evolved, and three equivalents or 402 parts of nitrate of bismuth formed.

MATERIALS.			PRODUCTS.
1 eq. Nitric Acid... 54	1 *eq. Binox. Nitrog.* 30		1 eq. Binox. Nitrog. ... 30
	3 *eq. Oxygen*..... 24	3eq Ox.Bism.240	
3 eq. Bismuth..... 216			
3 eq. Nitric Acid.. 162			3 eq Nitrat. Bism. ... 402
432			432

When nitrate of bismuth is mixed with water, two bismuthic salts are produced; a soluble supersalt (*ternitrate*,) and an insoluble subsalt (*trisnitrate*.)

MATERIALS.			PRODUCTS.
1 eq. Nitrate Bismuth = 134			1 eq. Ternitrate Bismuth = 242
3 eq. Nitrate Bismuth = 402	2 *eq. Nitric Acid*..... 108		
	1 *eq. Nitric Acid* 54		1 eq. Trisnitrate Bismuth = 294
	3 *eq. Oxide Bismuth* = 240		
536			536

Properties.—It is a dull white, inodorous, tasteless pulverulent substance, which, when examined by a magnifier, is found to consist of very fine silky acicular crystals. It is nearly insoluble in water, but is readily dissolved by nitric acid. By exposure to light it becomes grayish.

Characteristics.—Hydrosulphuric acid, or the hydrosulphates, blacken it, by forming the sulphuret of bismuth. It dissolves in nitric acid without effervescence. Heated on charcoal by the blowpipe flame it gives out nitrous acid (or its elements,) and yields the yellow oxide of bismuth; and by a continuance of the heat, the oxide is reduced, globules of metallic bismuth being obtained, which may be readily distinguished from globules of lead by their brittleness; for, when struck sharply by a hammer on an anvil, they fly to pieces; from antimony they are distinguished by their solubility in nitric acid.

Composition.—Its composition, according to Mr. Phillips, (*Phil. Mag*. Dec. 1830, p. 409.) is as follows:—

	Atoms.	*Eq. Wt.*	*Per Cent.*	*R. Phillips.*
Oxide of Bismuth.....	3	240	81·64	81·92
Nitric Acid.....	1	54	18·36	18·36
Trisnitrate of Bismuth.....	1	294	100·00	100·28

Purity.—Its freedom from any carbonate (as of lead) is distinguished by its solution in nitric acid without effervescence. Diluted sulphuric acid added to the solution throws down a white precipitate, if lead be present.

It is soluble in nitric acid without effervescence. Diluted sulphuric acid being added to the solution, nothing is thrown down. *Ph. Lond.*

It forms a colourless solution with nitric acid and without effervescence: not subject to adulteration. *Ph. Ed.*

Physiological Effects. *α. On Animals.*—It acts as a local irritant and caustic poison. Moreover it appears to exercise a specific influence over the lungs and nervous system. (Orfila, *Toxicol. Gén.*)

β. On Man.—In *small doses* it acts locally as an astringent, diminishing secretion. On account of the frequent relief given by it in painful affections of the stomach, it is supposed to act on the nerves of this viscus as a sedative. It has also been denominated tonic and antispasmodic. Vogt (*Pharmakodynamik*, i. 288, 2te Aufl.) says, that when used as a cosmetic, it has produced a spasmodic trembling of the muscles of the face, ending in paralysis.

Large medicinal doses disorder the digestive organs, occasioning pain, vomiting,

purging, &c.; and sometimes affecting the nervous system, and producing giddiness, insensibility, cramps of the extremities, &c.

The following is the only reported case of poisoning with it. A man took two drachms by mistake, and died therefrom on the ninth day. In addition to the usual symptoms of gastro-enteritis, there was a disordered condition of the nervous system, indicated by cramps of the hands and feet, disordered vision, and delirium. It is deserving also of remark, that there were difficulty of breathing, and salivation. Post-mortem examination showed inflammation throughout the alimentary canal; the spinal vessels were gorged with blood, particularly towards the cauda equina; there was fluid in the cerebral ventricles; and the inner surface of both ventricles of the heart was very red. (Christison's *Treatise on Poisons.*)

Use.—It has been principally employed in those chronic affections of the stomach which are unaccompanied by any organic disease, but which apparently depend on some disordered condition of the nerves of this viscus; and hence the efficacy of the remedy is referred to its supposed action on these parts. It has been particularly used and recommended to relieve gastrodynia and cramp of the stomach, to allay sickness and vomiting, and as a remedy for the waterbrash. It has also been administered in intermittent fever, in spasmodic asthma, &c. Hahnemann has recommended a portion to be introduced into a hollow tooth, to allay toothach. I have used it, with advantage, in the form of ointment, applied to the septum nasi, in ulceration of this part, and as a local remedy in chronic skin diseases.

Administration.—The usual dose of this remedy is from five grains to a scruple. I seldom commence with less than a scruple of it for a dose, and have repeatedly exhibited half a drachm without the least inconvenience. It may be administered in the form of linctus or pill. The ointment which I have above referred to was composed of one drachm of the trisnitrate, and half an ounce of spermaceti ointment.

Antidotes.—No chemical antidote is known. Emollient drinks should be administered, and the poison evacuated from the stomach as speedily as possible. The antiphlogistic plan is to be adopted, to obviate inflammation.

Order XXIV.—TIN.

STANNUM, *L. E. D.* (U. S.)—TIN.

History.—Tin has been known from the most remote periods of antiquity. It is mentioned by Moses (*Numbers*, xxxi. 22.) and by Homer. (*Iliad*, xi. 25.) The alchymists called it *Jove*, or *Jupiter*.

Natural History.—It is peculiar to the mineral kingdom. It occurs in two states; as an oxide (the *Tin Stone* and *Wood Tin* of mineralogists,) and as a sulphuret (*Tin Pyrites.*) It is found in both states in Cornwall, which has long been celebrated for its tin works. The Phœnicians, who were perhaps the first people who carried on commerce by sea, traded with England and Spain for tin at least 1000 years before Christ.

Preparation.—In Cornwall, *Stream Tin* (a variety of *Tin Stone*) is smelted with charcoal or with culm, in a reverberatory furnace. The metal thus procured is subsequently made hot, and then let fall from a height, or is struck with a hammer, by which it splits into a number of irregular prisms, somewhat like a basalt pillar. This is called *Grain Tin;* of this there are two kinds, the *best* which is used for dyers,—and a second employed in the manufacture of tin-plate, and which is called *tin-plate grain*. *Mine Tin* (another variety of *Tin Stone*) is stamped, washed, roasted, afterwards smelted with Welsh culm and limestone, by which *Block Tin* is procured; the finest kind of which is called *Refined Tin*. (Mr. John Taylor, *Ann. Phil.* iii. 449.)

Besides the two varieties of tin just described, other kinds are met with in