

be carefully avoided; for severe inflammation, and even gangrenous ulceration, may be produced by not attending to this caution. I have before mentioned (p. 559) that in a very few cases severe and even fatal constitutional disorder has appeared to have resulted from the use of antimonial ointment.

ORDER XIX.—GOLD AND ITS COMPOUNDS.

1. AU'RUM.—GOLD.

HISTORY.—Gold has been known from the most remote periods of antiquity. It was in common use 3,300 years since, (*Exodus*, xi. 2.) and was probably the first metal with which mankind was acquainted. The alchemists termed it *Sol* or *Rea metallorum*.

NATURAL HISTORY.—It is found only in the metallic state; commonly alloyed with other metals, especially with silver, tellurium, copper, and iron. It occurs in veins in primitive rocks; and is also found in alluvial deposits in small lumps or particles called *gold dust*. It is found in several parts of Europe, Asia, and Africa, but principally in America, especially the southern part.

PREPARATION.—The mode of extracting gold varies in different places, principally according to the nature of the gangue. The ore is freed as much as possible from foreign matters, by mechanical processes (stamping, washing, &c.) and sometimes by roasting; and is then smelted with some flux, as borax, to separate the stony matters. Or it is fused with lead, and afterwards submitted to cupellation: or amalgamated with mercury, and, after straining, distilled.

The separation of gold from silver (*parting*) may be effected in the *dry way* by fusion, either with sulphur, by which metallic gold and sulphuret of silver are procured; or with sesquisulphuret of antimony, by which sulphuret of silver and an alloy of gold and antimony are procured: the last-mentioned metal may be separated by heating the alloy in the air, as well as by other methods. Gold may also be freed from silver in the *wet way* by the process of *quartation*: that is, by treating an alloy of three parts of silver and one of gold with nitric acid, which dissolves the silver; or by action of sulphuric acid (see *Cupri Sulphas*.)

PROPERTIES.—The crystalline forms of native gold are the cube, the regular octohedron, and their modifications. Pure gold has a rich yellow colour, a sp. gr. of 19.2 to 19.4, is soft, very ductile, and malleable, fuses at a bright red heat (2016° F. according to Daniell,) and in the liquid state has a brilliant greenish colour. Its equivalent is somewhat uncertain: Gmelin fixes on 66,—Thomson, 100,—Berzelius and Graham, 99.6,—Turner, 199.2,—and Brande, 200: I shall adopt the last.

Characteristics.—Gold is readily distinguished by its colour and softness, by its being unacted on by nitric acid, and by its ready solubility in nitro-hydrochloric acid. The solution is yellow, stains organic matters (as the skin) purple, throws down, by the addition of protosulphate of iron, metallic gold in the finely-divided state, by protochloride of tin a dark or black precipitate, and by protonitrate of mercury a black precipitate: heated with borax by the blowpipe it forms a pink or rose-coloured glass, but is subsequently reduced.

PHYSIOLOGICAL EFFECTS.—Gold, like other metals, has been frequently supposed to be inert while it retains its metallic condition, but in this, as well as in some other instances, the accuracy of the assumption has been denied. Both Chrestien (*Sur une Nouvelle Remède dans le Traitement des Mal. Vén.* Paris, 1811.) and Niel, (*Recherches et Observations sur les Effets des Préparations d'Or.* Paris, 1821.) as well as other writers, assert that finely-divided metallic gold (*pulvis auri*) produces the same constitutional effects as those caused by the various preparations of this metal, but in a milder degree, while it excites little or no local irritation. It is said to promote the secretions of the skin, kidneys, and salivary glands.

USES.—It has been employed as an antivenereal and antiscrofulous remedy by

Chrestien, Niel, and others, with considerable success. It is said to be preferable to the other preparations of this metal in delicate and nervous subjects, females, and infants. Gold leaf (*aurum foliatum seu lamellatum*) is used by dentists for filling decayed teeth, and was formerly employed by apothecaries for covering pills (*ad inaurandas seu obducendas pilulas*.)

ADMINISTRATION.—It has been administered internally in doses of from a quarter of a grain to a grain three or four times a day. Chrestien used it by way of friction on the tongue and gums. Niel employed it endermically (that is, applied it to the skin deprived of the epidermis) in the form of ointment, composed of one grain of gold and thirty grains of lard.

PULVIS AURI (Fr. Cod.) is prepared by rubbing leaf gold (*aurum in laminas exilissimas complanatum*) with sulphate of potash, sifting and washing with boiling water to remove the sulphate: or by adding protosulphate of iron to terchloride of gold, and washing the precipitate, first with water, then with dilute nitric acid.

2. AURI TERCHLORIDUM.—TERCHLORIDE OF GOLD.

PREPARATION.—In the French Codex this is ordered to be prepared by dissolving, with the aid of heat, one part of gold in three parts of nitro-hydrochloric acid. The solution is to be evaporated until vapours of chlorine begin to be disengaged, and then allowed to crystallize.

PROPERTIES AND COMPOSITION.—Chloride of gold is in the form of small crystalline needles, of an orange-red colour, inodorous, and having a strong, styptic, disagreeable taste. It is deliquescent, on which account it should be preserved in a well-stoppered bottle: it is soluble in water, alcohol, and ether. When heated it evolves chlorine, and is converted, first, into protochloride, and then into metallic gold, which is left in the spongy state. It reddens litmus, stains the cuticle purple, is reduced by many metals (as iron, copper, tin, zinc, &c.) by several of the non-metallic elementary substances, (as phosphorus,) by some metallic salts, (as protosulphate of iron,) and by many organic bodies, (as charcoal, sugar, gum, gallic acid, extractive, &c.) all of which, therefore, are incompatible with it. Nitrate of silver occasions a precipitate of chloride of silver and oxide of gold: hydrochloric acid removes the latter. (For other characteristics, *vide* p. 668.) Terchloride of gold consists of 1 eq. gold = 200 + 3 eqs. chlorine, 108. The before-mentioned crystals also contain hydrochloric acid: hence they are regarded by some as constituting a double chloride of hydrogen and gold.

PHYSIOLOGICAL EFFECTS. *a. On Animals.*—Orfila (*Toxicol. Gén.*) examined the effects of chloride of gold on animals, and infers from his experiments that when introduced into the stomach it acts as a corrosive, (but with less energy than the bichloride of mercury,) and destroys animals by the inflammation of the coats of the alimentary canal which it sets up.

β. On Man.—On man its effects are analogous to those of bichloride of mercury. In *small doses* it acts, according to Dr. Chrestien, more energetically as a stimulant, though less powerfully as a sialogogue, than corrosive sublimate. It promotes the secretions of the skin, the salivary glands, and the kidneys. Taken to the extent of one-tenth of a grain daily, it has occasioned violent fever. "This excitation," says Chrestien, "I regard as indispensably necessary for the cure of the diseases against which I administer gold: restrained within proper limits, it is never accompanied with any remarkable or even sensible lesion of the functions. The mouth is good, the tongue moist, the appetite continues, the bowels are not disordered, and there is ordinarily only augmentation of urine and transpiration: but if carried too far, we incur the risk of producing general erythema, inflammation of this or that organ, according to the predisposition of the patient, which will not only check the treatment, but may even induce a new disease, often more troublesome than the original one. The suspension or modi-

fication of the remedy should be governed by the unusual and sustained heat of the skin." Cullerier, (Magendie, *Formulaire*, 8^{me} éd. p. 305.) the nephew, has seen one-fifteenth of a grain excite, at the second dose, gastric irritation, dryness of the tongue, redness of the throat, colic, and diarrhœa. When it promotes the secretion of saliva, it does not, as mercury, affect the teeth and gums. (Grötznner, *Rust's Magazine*, B. 21, quoted by Wibmer.) Magendie (*Op. cit.*) has seen violent gastritis, accompanied by nervous symptoms (cramps and pains in the limbs, agitation, and loss of sleep,) and afterwards great heat of skin, obstinate sleeplessness, and fatiguing erections. In *large doses*, it would probably occasion symptoms analogous to those produced by the use of poisonous doses of bichloride of mercury.

USES.—It has been employed, with variable success, as a substitute for mercury in the treatment of the secondary symptoms of syphilis. A more extended experience of it is, however, necessary to enable us to speak of its remedial powers with confidence. In the hands of Chrestien, (*Op. cit.*) Niel, (*Op. cit.*) Cullerier, (*Dict. des Sciences Méd.* xxxvii art. *Or.*) Legrand, (*De l'Or, de son Emploi dans le Traitement de la Syphilis*. Paris, 1832.) and others, it has proved most successful.

It has also been used in scrofulous affections, bronchocele, chronic skin diseases, scirrhus tumours, &c. Duportal (*Ann. de Chimie*, lxxviii. 55.) cured with it a case of obstinate ulceration of the face, regarded by him as cancerous, and which had resisted all the ordinary methods of cure.

Legrand (*Lond. Med. Gaz.* xx. 414.) has used chloride of gold, acidified with nitric acid, as a caustic, in syphilitic, scrofulous, and scorbutic ulcers, cancerous growths, and ulcerations of the neck of the uterus.

ADMINISTRATION.—Internally, it has been given in doses of one-twentieth of a grain, made into pills with starch. But as organic matters decompose it, it is better to use it in distilled water, or apply it by friction to the mouth, in quantities of from one-sixteenth to one-sixth of a grain.

ANTIDOTE.—The same as for poisoning by bichloride of mercury.

3. SO'DII AU'RO-TERCHLO'RIDUM.—AURO TERCHLORIDE OF SODIUM.

In the French Codex this is ordered to be prepared by dissolving 85 parts by weight of terchloride of gold, and 16 parts of chloride of sodium, in a small quantity of distilled water: the solution is to be evaporated by a gentle heat until a pellicle forms, and then put aside to crystallize.

The auro-terchloride of sodium crystallizes in orange-coloured quadrangular, elongated prisms, which are permanent in the air; but when they contain any uncombined terchloride of gold, they are slightly deliquescent. They are soluble in water. When heated chlorine is evolved, and a mixture of gold and chloride of sodium is left behind. They consist of 1 eq. terchloride of gold = 308; 1 eq. of chloride of sodium = 60, and 4 eqs. of water = 36.

Its effects and uses are analogous to the terchloride of gold, over which it has the advantages of being more constant and less costly. It is exhibited internally in doses of one-twentieth to one-tenth of a grain, made into pills with starch or lycopodium. Mixed with twice its weight of orris powder or lycopodium, it may be used in frictions on the tongue and gums. An ointment (composed of one grain to thirty-six grains of lard) may be applied, endermically, to the skin, deprived of its epidermis by a blister.

4. AU'RI TEROX'YDUM.—TEROXIDE OF GOLD.

This substance sometimes called *peroxide of gold* or *auric acid*, is ordered in the French Codex, to be prepared by boiling 4 parts calcined magnesia with 1 part terchloride of gold and 40 parts of water. Then wash, first with water, to

remove the chloride of magnesium, afterwards with dilute nitric acid, to dissolve the excess of magnesia.

Teroxide of gold is brown; in the state of hydrate reddish yellow. It is reduced by heat and solar light. It is insoluble in water, but is soluble in hydrochloric acid (forming terchloride of gold,) and in alkalis (forming aurates.) It consists of 3 equivalents oxygen, $24 + 1 \text{ eq. gold} = 200$.

It is used internally, in venereal and scrofulous diseases, in doses of from one-tenth of a grain to a grain, made into the form of pills with extract of mezereon.

1. AURATE OF AMMONIA. *Ammoniuret of Teroxide of Gold; Fulminating Gold.*—This is prepared by adding ammonia to a solution of chloride of gold. It is a yellowish-brown powder which explodes when heated to 400° . It has been employed in the same cases as the preceding compounds, as well as in fevers, nervous affections, &c. In some cases it has produced very serious, and even fatal, results. (Plenck, *Toxicologia*, ed. 2^{da}, 230.)

2. PURPURA MINERALIS CASSII. *Purple of Cassius; Aurum Stanno paratum, Fr. Cod.*—The nature of this compound is so imperfectly known, that it is impossible at present to assign to it its proper chemical name. Its active principle is probably oxide of gold. There are several methods of preparing it: the simplest is to add a solution of the mixed protochloride and perchloride of tin to a solution of terchloride of gold, until a precipitate is no longer produced. Filter and dry the precipitate.

The purple of Cassius is soluble in ammonia, and does not form an amalgam with mercury: hence it does not appear to contain any metallic gold. Its composition varies according to the mode of procuring it. Gold, oxygen, and tin, are its essential constituents.

This preparation is used in the same cases as the other preparations of gold.

5. AU'RI IO'DIDUM.—IODIDE OF GOLD.

This is ordered to be prepared in the French Codex, by adding a solution of iodide of potassium to a solution of chloride of gold. Double decomposition takes place, and iodide of gold falls down. This is to be collected on a filter, and washed with alcohol, to remove the excess of iodine which precipitates with it.

Iodide of gold is of a greenish-yellow colour, insoluble in cold water, but slightly soluble in boiling water. Heated in a crucible it evolves iodine vapour, and is converted into metallic gold. It is probably composed of 1 eq. iodine = 126, and 1 eq. gold = 200.

It has been employed internally, in venereal affections, in doses of from one-fifteenth to one-tenth of a grain. Externally it has been applied in the form of ointment to venereal ulcers. (Pierquin, *Journ. de Progrès.*)

6. AU'RI TERCYAN'IDUM.—TERCYANIDE OF GOLD.

The directions for preparing this salt in the French Codex, are somewhat diffuse. The process consists essentially in very carefully adding a solution of pure cyanide of potassium to a solution of chloride of gold, until a precipitate (*cyanide of gold*) ceases to be formed. The chloride of gold, prior to solution, should be deprived of all excess of acid by heating it in a salt-water bath.

Cyanide of gold is a yellow powder, which is insoluble in water. It consists, probably, of 3 eqs. cyanogen = 78, and 1 eq. gold 200. It has been used in venereal and scrofulous affections, both externally and internally. The dose is from one-fifteenth to one-tenth of a grain, made into a pill, with some inert powder.