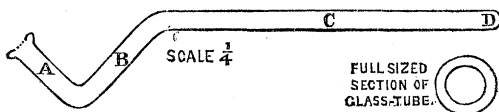


The extinct *Phascolomys Mitchelli*, indicated by remains brought to England in 1835 by Sir Thomas Mitchell, C.B., the discoverer of the bone-caves of Wellington Valley, Australia, is determined by specimens subsequently obtained by Prof. Alex. M. Thomson and Gerard Krefft, Esq., from the same caves. A second species, distinguished by characters of the nasal bones, is called, after its discoverer, *Phascolomys Krefftii*. Modifications of the lacrymal, maxillary, and palatal bones in the existing kinds of Wombat are also applied to the determination of the fossils: specimens from the freshwater deposits of Queensland are thus shown to belong to the species, *Phascolomys Mitchelli*, originally founded on fossils from the breccia-caves of New South Wales. The author next proceeds to point out the characters of the mandible in existing Wombats available in the determination of extinct species of *Phascolomys*. On this basis he defines specimens which he provisionally refers to his *Phascolomys Krefftii*. He then points out the mandibular characters of *Phascolomys Mitchelli*, and shows that the existing *Phascolomys latifrons* was represented by mandibular fossils from the breccia-caves of Wellington Valley. Proceeding next to the description of fossil mandibular remains of the genus *Phascolomys*, from the freshwater deposits of Queensland, the author defines *Phascolomys Thomsoni*, *Phasc. platyrhinus*, and *Phasc. parvus*. The latter, seemingly extinct, species is markedly inferior in size to any of the known existing species. An account of the extinct kinds of Wombat, exceeding in size the existing species, will be the subject of a succeeding communication. The present is illustrated by subjects occupying seven plates and eight woodcuts, all the figures being from nature and of the natural size.

II. "On the Solvent Power of Liquid Cyanogen." By G. GORE,  
F.R.S. Received September 1, 1871.

In the following experiments a number of stout tubes of refractory glass of the annexed shape were employed.



Each tube was closed at one end, and had a flanged mouth at the other. The limb A was  $1\frac{1}{2}$  inch long, the limb B 2 inches, and C 7 inches.

In making the experiments, each tube was first filled, to an extent of  $5\frac{1}{2}$  inches of its length, with highly dried crystals of mercuric cyanide; a small fragment of asbestos\* was then pushed tightly against the end of the cyanide by means of a thin rod of gutta percha, and the bend of the tube cleaned by means of a slender brush. A number of taper plugs of gutta

\* This may be dispensed with if the mercuric cyanide is perfectly dry.

percha were previously made by softening the end of a rod of that substance in boiling water and then chilling it; and loops of thin copper wire were also prepared for the purpose of securing the plugs.

Having placed in the bend of the tube the substance to be operated on, a plug was wetted with chloroform and at once firmly inserted in the mouth of the tube and secured by means of the wire. A wet rag was wrapped round the limb B, and the portion of the limb C containing the cyanide was inserted in a loosely fitting tube of copper foil within a tube of wrought iron about two feet long, supported in a nearly horizontal position, with the end D the lowest.

A vessel having been previously arranged to drop cold water continually upon the wet rag, a glass screen was placed by the side of the exposed part of the glass tube, and heat was gradually applied, by means of a row of Bunsen's burners, to the part of the iron tube containing the limb C. In about four minutes liquid cyanogen began to form, and in about five minutes longer about two inches in length of the bend was filled with that liquid, and the heat was then discontinued. The temperature of the iron tube was below that of visible redness; if the heat applied was not too great the glass tube retained its original form, and might afterwards be easily removed from its casing and set aside for future examination. A white fog, and signs of a heavy vapour in the bend of the tube, always immediately preceded the formation of the liquid. In many instances some of the cyanogen retained the liquid state for several days, and even weeks, especially if the bend of the tube was kept cool by means of a wet sponge.

The cyanide employed in the experiments should be crushed to a coarse powder, and highly heated a long time, with constant stirring, until it is of a slightly brown colour; otherwise, immediately previous to the appearance of the liquid cyanogen, a small quantity of a brownish treacley liquid distils over and affects the results.

More than 130 substances, including solids and liquids, and a great variety of simple and compound bodies, were subjected to the action of the liquid; the substances were, in nearly all cases, as free from moisture as it was possible to obtain them. The following are the results obtained:—

*Substances soluble in liquid Cyanogen at 60° Fahr.*—Camphor dissolved rapidly and copiously. Hydrate of chloral quickly and freely. Solid  $C_2Cl_6$  was freely soluble. Iodine was moderately soluble, and formed a deep red liquid. Picric acid moderately soluble; the solution was yellow. White phosphorus dissolved very slowly, and to but a small extent\*. Gum benzoin, also white cane-sugar, dissolved slowly and sparingly. Gum assafoetida and gamboge dissolved slightly, and formed yellowish liquids. Bisulphide of carbon,  $C_2Cl_2$  and  $C_2Cl_4$ , mixed perfectly with the liquid;  $CCl_4$  mixed less perfectly. Water was only slightly absorbed.

\* See also Gmelin's Handbook, vol. viii. p. 147, article "Cyanide of Phosphorus."

*Substances insoluble in liquid Cyanogen at 60° Fahr.*—Water (nearly insoluble, would not mix with the liquid\*, and produced no chemical change). Iodic acid. Fine lampblack. Well-burned wood-charcoal (two kinds). Crystals of boron. Boracic acid. Crystals of silicon. Precipitated silica. Titanic acid. A fragment of sulphur. Selenium. Selenious acid. Tellurium. Arsenic. Arsenious and arsenic acids. Realgar. Orpiment. Antimony. Antimonic oxide. Antimonic acid. Fused fluoride of antimony. Red sesquisulphide of antimony. Bismuth. Fluoride of bismuth. The oxides of iridium and silver. Argentic nitrate, fluoride, chloride, iodide, and iodate. Mercury. Mercuric chloride. Copper. Cuprous iodide. Chloride of Nickel. Iron. Mundic. Peroxide of manganese. Fluoride of manganese. Chromic oxide. Violet chloride of chromium. Oxide and fluoride of uranium. Red oxide and peroxide of lead. Plumbic chromate. Tin. Cadmium. Sulphide of cadmium. Zinc. Tungstic and niobic acids. Oxide of cerium. Carbonate of glucinum. Aluminium. Magnesium. Magnesia. Dry lime. Anhydrous carbonate of sodium. Potassic nitrate, bromide, iodate, and fluozirconate. Bichromate and bitartrate of rubidium. Bitartrate of cæsium. Chloride and carbonate of ammonium. Oxalate of cerium. Paracyanogen. Cyanide of mercury. Nitrocyanide of titanium. Pyrogallic, gallic, tannic, and succinic acids. Sulphate of quinine. Alloxan. Starch. Milk-sugar. Egg-albumen. Gun-cotton. The gums ammoniac, animi, copal, dammar, elemi, galbanum, guaiacum, juniper, kowrie, mastic, myrrha, olibanum, opoponax, sagapenum, seed-lac, shellac, thus, and tragacanth. Yellow resin. Egyptian asphalt. Gutta percha. India-rubber. Paraffin. Anthracene. Stearine. Bee's-wax. Spermaceti. Aloes—Barbadoes, Cape, hepatic, and Socotrine. Brazil-wood. Red sandal-wood. Cuba yellow fustic. Terra-japonica.

The following substances produced some changes, but did not dissolve:—Perfectly white and dry iodic acid made the liquid of a pink colour. Dry selenious acid and iodate of potassium became slightly pink. Yellow chloride of nickel (nearly anhydrous) became at once green†. Cuprous iodide acquired the colour of vermilion. Sesquicarbonate of ammonium became brown. The gums myrrha and guaiacum coloured the liquid yellowish. Bisulphide of carbon, saturated with sulphur, rapidly set free its sulphur in the form of crystals, the bisulphide being absorbed and dissolved by the cyanogen. A saturated solution of phosphorus in bisulphide of carbon quickly liberated its phosphorus in a similar manner, but not in a crystalline form. The contact of moisture and an alkaline substance with the liquified gas caused the formation of a brown solid body, apparently paracyanogen.

From these results it is evident that liquid cyanogen, at 60° Fahr., is a remarkably inert body, and possesses very little solvent power for sub-

\* See Gmelin's Handbook of Chemistry, vol. vi. p. 388.

† Probably in consequence of the presence of a trace of moisture.

stances in general; out of 132 substances only 14 were dissolved, and not a single one exhibited signs of strong chemical action.

### III. "On Fluoride of Silver.—Part III." By G. GORE, F.R.S.

Received October 6, 1871.

(Abstract.)

In this communication the author has finally shown that the action of iodine, under the influence of heat (including the process described by Kämmerer, *Phil. Mag.* 1863, vol. xxv. p. 213, for the isolation of fluorine), does not liberate uncombined fluorine, but produces fluoride of iodine and iodide of silver, a double salt, composed of iodide of silver and fluoride of platinum, being produced at the same time by corrosion of the platinum vessels, if the temperature approaches a red heat.

The fluoride of iodine produced is a highly volatile and colourless liquid, does not corrode mercury or red-hot platinum, corrodes glass at 60° Fahr., and crystals of silicon at a red heat, also platinum in contact with argentic fluoride in a state of fusion; it instantly turns a deal splint black, fumes powerfully in the air, and is decomposed with violence by water into hydrofluoric and iodic acids, in accordance with the following equation:— $\text{IF}_5 + 3\text{H}_2\text{O} = 5\text{HF} + \text{HIO}_3$ . It dissolves iodine, and is absorbed by that substance; it is also absorbed either by argentic fluoride or iodide when those substances are cooled in its vapour, and may be expelled from them at a red heat. Its vapour quickly darkens the colour of a deal splint, and very gradually turns paraffin brown.

The platinum vessels in which the reaction with iodine was effected were considerably corroded (but less so than when bromine or chlorine were employed), and many expensive vessels were rendered useless by this cause during the experiments.

No chemical change occurred on heating argentic fluoride to redness with pure carbon.

By heating this fluoride to redness in a current of dried coal-gas, it was wholly reduced to metallic silver, hydrofluoric acid and tetrafluoride of carbon being evolved.

In liquid cyanogen, argentic fluoride neither dissolved nor suffered chemical change; but at a low red heat, in a current of dry cyanogen gas, it was entirely reduced to metal, either nitrogen and tetrafluoride of carbon, or fluoride of cyanogen being liberated. An aqueous solution of silver fluoride was precipitated by passing a prolonged current of cyanogen gas through it. Fluoride of silver was also decomposed by fusion with paracyanogen.

Argentic fluoride was not dissolved or chemically changed by immersion in anhydrous liquified hydrocyanic acid; but by passing the dry acid in vapour over the red-hot salt, the latter was decomposed and metallic