The following Gentlemen were elected Fellows of the Society:—

ISAAC ANDERSON-HENRY, Esq.
 GEORGE ELDER, Esq.
 Sir CHARLES A. HARTLEY, C.E.
 DAVID MACGIBBON, Esq.
 Rev. THOMAS MELVILLE RAVEN, M.A.
 ALEXANDER HOWE, Esq.
 Viscount WALDEN.
 Professor ALEXANDER DICKSON.

Monday, 18th January 1869.

PROFESSOR KELLAND, Vice-President, in the Chair.

The following Communications were read:—

1. On the Connection between Chemical Constitution and Physiological Action.

On the Physiological Action of the Salts of the Ammonium Bases derived from Atropia and Conia. By Dr A. Crum Brown and Dr Thomas R. Fraser.

Atropia.—Atropia is a nitrile base. All we know of its constitution is, that by the action of strong acids and bases it is decomposed, in accordance with the equation.*

So that atropia may be considered as tropia, in which one atom of hydrogen has been replaced by troyl, the radical of tropic acid. Tropic acid belongs to the aromatic series, and is considered by Kraut to be phenylsarcolactic acid—HO · CH₂ · CH(C₆H₅)COOH. Of the constitution of tropia we know nothing whatever, except that it is a nitrile base.

Iodide of methyl-atropium.—Iodide of methyl acts very readily on atropia, a good deal of heat is produced, and after the reaction is over, the iodide of methyl-atropium remains as a white mass. From this the excess of iodide of methyl was removed by a current of air, and the dry salt dissolved in water, filtered, and evaporated at a temperature not exceeding 40° C. The concentrated solution thus obtained, on cooling, deposits the salt in prismatic crystals, apparently belonging to the monoclinic system; sometimes part of

* Kraut.—Annalen der Ch. u. Ph., cxxviii. 280, cxxxiii. 87, cxlviii. 238. Lossen.—Ib., cxxxi. 43, cxxxviii. 230.

the salt separates as a heavy oil, which soon crystallises. These crystals have the composition $C_{17}H_{23}NO_3CH_3I$. They are tolerably stable, bearing a temperature of 100° C. without much alteration. When they are powdered, or when their solution is warmed, a pleasant fruity smell is observed.

Sulphate of methyl-atropium.—The sulphate was prepared from the iodide by the method formerly described for the preparation of sulphate of methyl-strychnium, &c. It is a white crystalline salt, very deliquescent, and very soluble in water.

Iodide of ethyl-atropium.—Iodide of ethyl acts readily on atropia, but not so energetically as iodide of methyl. In preparing the iodide of ethyl-atropium, atropia was treated with a considerable excess of iodide of ethyl in sealed tubes at 100° C. for an hour. The remainder of the process, and the preparation of the sulphate, are the same as in the case of the methyl derivative.

The authors intend, on some future occasion, to describe these substances more minutely; for their present purpose, the description given above seems sufficient.

Atropia has a somewhat complicated physiological action, for it directly influences the functions of the cerebro-spinal, and also of the sympathetic nervous system.

The action of the methyl and ethyl derivatives on the cerebro-spinal nervous system is different from that of the natural base, while the action on the sympathetic system is essentially the same.

The principal effects produced by atropia on the cerebro-spinal nervous system are excitation of the spinal cord,* and paralysis of the motor and sensory nerves. In a previous paper, the authors showed that the spinal stimulant action of strychnia, brucia, thebaia, codeia, and morphia, is not possessed by the salts of the ammonium bases derived from these alkaloids, but that in its place these derivatives possess a markedly different paralysing action on the peripheral terminations of motor nerves. They now announce that a similar change occurs in the methyl and ethyl derivatives of atropia. These derivatives are more powerful paralysing substances than atropia itself.

A considerable amount of spinal stimulant and of paralysing action may be produced by a non-fatal dose of atropia; and it is

* See *Proc. Roy. Soc. of Ed.* vol. vi. 1868–69, p. 434.

probable that the one action is, to a certain extent, antagonistic to the other. As the methyl and ethyl derivatives, however, combine with the ordinary paralysing action of atropia, an additional amount of paralysing action bearing some ratio to the absent spinal stimulant action of the natural base, these derivatives affect the motor nerves much more powerfully than atropia itself. Probably, for these reasons, the salts of methyl- and ethyl-atropium are fatal to the lower animals in much smaller doses than the salts of atropia itself.

Paralysis of the vagi nerves and dilatation of the pupil are caused by these derivatives of atropia.

Conia.—The alkaloid prepared from *Conium maculatum* (hemlock) has been shown by Von Planta and Kekulé* to be a variable mixture of two bases, to which they give the names of “conia” and “methyl-conia.” These bases resemble one another very closely in physical properties. Their composition is represented by the formulæ $C_8H_{15}N$ and $C_9H_{17}N$. The chemists above named investigated very completely the action of iodide of ethyl on conia, and proved that conia (or, as it is called in the present paper, *normal conia*) is an imide base, and that methyl-conia is a nitrile base.

The substances examined in the present paper are:—

1st, *Conia*—samples of which were obtained from Messrs Duncan and Flockhart, Macfarlan & Co., and Morson. The authors are also indebted to the kindness of Dr Christison for the opportunity of examining the action of a specimen of conia which he prepared in the year 1835.

2d, *Methyl-conia*—prepared from hydriodate of methyl-conia, produced by the union of iodide of methyl and *normal conia*.

And 3d, *Salts of dimethyl-conium*—obtained by the union of iodide of methyl and the methyl-conia contained in conia as obtained from the plant.

Iodide of methyl acts readily upon conia, producing a syrupy or crystalline substance, which is a mixture of hydriodate of methyl-conia and iodide of dimethyl-conium,—the former produced from the normal conia, and the latter from the methyl-conia. The action of caustic potash decomposes the hydriodate of methyl-conia, setting the base free, while the iodide of dimethyl-conium is unattacked. The two substances can thus be readily separated from each other.

* *Annalen der Chemie und Pharmacie*, lxxxix. 5.

The authors find that the salts of conia and of methyl-conia very closely resemble each other in action and in poisonous activity. Their action agrees with the descriptions of the effects of conia by the more trustworthy of previous observers. Among the most obvious of the effects on rabbits were stiffness of the limbs, causing difficulty in moving about; spasmodic starts; distinct increase of reflex excitability; gradually increasing paralysis with diminution, and afterwards disappearance, of the increased reflex excitability; and, finally, death by asphyxia. Shortly before death a few starts and feeble convulsions usually occurred, but these symptoms were apparently caused by the advancing asphyxia.

The symptoms in frogs were mainly those of paralysis, and the authors confirm the observations of Köl liker and Guttmann, that this paralysis in the case of ordinary conia is due to a curare-like action. They further find that methyl-conia also acts by paralysing the terminations of motor nerves.

The salts of dimethyl-conia differ from those of conia and of methyl-conia in never directly producing convulsant effects or other symptoms of abnormal activity of the reflex function, and in being much less active as poisons. In rabbits and frogs, the symptoms were invariably those of paralysis; and, in the latter animal, the authors have demonstrated that this paralysis is due to an action on the terminations of the motor nerves.

The samples of conia which have been examined by the authors were found to contain very varying proportions of normal conia and of methyl-conia; but as these two substances appear to be about equally active as poisons, it is probable that the very variable potency of commercial conia is due to its adulteration with a greater or less amount of water, and, possibly, also to the presence of varying quantities of ammonia.*

* When the authors had nearly concluded their investigation on conia, they received a communication from MM. Jolyet and Cahours of Paris, informing them that these physiologists were ready to publish a paper upon the relative action of the salts of conia, ethyl-conia, and diethyl-conium. In order to secure simultaneous publication, it was arranged that the two papers should be communicated on the same day—the one to the Academy of Sciences of Paris, and the other to this Society.