

*Euleptorhamphus longirostris* Cuvier, Règne Anim., 2nd ed., vol. 2, p. 286, 1829.

The only specimen contained in the collection measures 336 mm. from the tip of the upper jaw to the end of the middle rays of the caudal, and the mandible projects 120 mm. beyond the upper jaw. I have previously recorded this species for Lord Howe Island.\*

*Aulacocephalus temmincki* Bleeker, Verh. Batav. Gen., vol. 26, 1857, Ichth. Jap., p. 12.

This record appears to be the first for the species in the Western Hemisphere, and the locality represents its most southerly known range. The places whence it has been obtained are widely separated, and are as follows: Japan, Siam, Mauritius, Kermadec Islands. The specimen measures 270 mm. in length.

*Epinephelus daemeli* Günther, Ann. Mag. Nat. Hist. (4), vol. 17, p. 391, 1876.

Quite common on the coast of New South Wales, and found also at Lord Howe and Norfolk Islands, this species is now recorded for the Kermadec Islands, and furnishes another instance of the similarity of their respective fish faunas, a matter to which I have already drawn attention.

*Upeneus signatus* Günther, Ann. Mag. Nat. Hist. (3), vol. 20, p. 59, 1867.

A similar example is provided by the red mullet, known from the waters of New South Wales and Lord Howe Island. Though not yet taken at Norfolk Island, it is tolerably certain to be found there when representative collections of its fauna are made.

##### 5. *The Action of Alkyl Iodides on Copper-oxide.*

By H. G. DENHAM, M.A., D.Sc., Ph.D.

[Read before the Philosophical Institute of Canterbury, 12th July, 1911.]

THE existence of cupric iodide in aqueous solution was first demonstrated by Moritz Trautz (Ber. d. D. Chem. Gesell., 1884, vol. 17, 1866), while Carnegie (Chem. News, 1889, vol. 59, 57) showed that any attempt to obtain solid cupric iodide by the evaporation of a solution containing  $\text{Cu}^{++}$  and  $\text{I}^{-}$  ions always led to the separation of iodine and cuprous iodide. Walker and Dover (Jour. Chem. Soc., 1905, vol. 87, 1584) obtained a compound of the formula  $\text{CuI}_4$ , but all efforts to obtain cupric iodide itself have up to the present proved futile. The presence of the slightest trace of moisture is sufficient to cause the decomposition of the unstable cupric iodide, and it is to this fact that our failure to prepare this salt is due.

The action of dried methyl-iodide vapour on heated copper-oxide appeared to the author to form a promising method for securing cupric iodide, and, as the vapour of the alkyl iodides can be readily dried over phosphorus-pentoxide, it was hoped that the iodide, once formed, would not suffer the usual decomposition.

\* Waite: Rec. Aust. Mus., vol. 5, p. 24, 1903.

The apparatus consisted of a distillation-flask containing the alkyl iodide and phosphorus-pentoxide, two U tubes containing the same drying reagent, a further U tube containing carefully dried copper-oxide, and an upright condenser connected to a receiver with suitable guard-tubes. Between the distillation-flask and the first drying-tube was interposed a T piece that allowed the entry of dry carbonic acid. After the whole apparatus had been sealed together, glass to glass, the various U tubes were heated to the required temperature and the apparatus exhausted. Dried carbonic-acid gas was then allowed to stream in, and, in order to insure the complete absence of oxygen, as well as complete drying, this operation was repeated about thirty times.

A preliminary experiment showed that at a temperature of 310° C. the oxide reacted quickly with the iodide, while at this temperature the vapour of the volatile alkyl compound suffered no decomposition. The rate at which the iodide distilled could be readily controlled, and it was generally so regulated that about 80 grammes were distilled over in 45 minutes.

A few experiments sufficed to show that the reaction, instead of taking the course represented by the equation  $\text{CuO} + 2 \text{CH}_3\text{I} = \text{CuI}_2 + (\text{CH}_3)_2\text{O}$ , took a much more complex path, the ultimate solid product invariably being cuprous iodide. Since not the slightest liberation of iodine was noted, as would occur were the cuprous iodide formed by the decomposition of the unstable cupric salt, it is to be concluded that cuprous iodide is the primary product of the reaction.

Numerous other products of the reaction were also obtained. The distillate always gave a strong aldehyde reaction, and it was also possible to collect a considerable quantity of gas. This proved to contain oxygen, carbon-monoxide, ethylene, methane, and its homologues. When methyl-iodide was used, the first three gases were contained to the extent of about 3 per cent., while the methane series bulked very largely in the total. The substitution of ethyl-iodide for methyl-iodide caused a marked change in the ratio of saturated to unsaturated hydrocarbons, for the percentage of ethylene rose to about 50 per cent., while the saturated hydrocarbons fell from about 90 to 45 per cent.

#### 6. *The Nature of Gamma Rays.*

By Professor T. H. LABY and P. W. BURBIDGE, B.Sc., Senior University Scholar.

[Read before the Wellington Philosophical Society, 12th July, 1911.]

DR. E. VON SCHWEIDLER pointed out in 1905 that an effect such as ionization by  $\alpha$  rays due to a finite number of independent events would be subject to fluctuations. The mathematical theory of the different experiments which have been made with light,  $\alpha$  and  $\beta$  rays, has been developed by Mr. N. R. Campbell.

One of us began some preliminary experiments in 1908 at the Cavendish Laboratory to detect discontinuous effects with  $\gamma$  rays. Two forms of apparatus have been used in our experiments. In the first two similar cylindrical ionization-vessels were placed close together with their axes directed to the source of the  $\gamma$  rays—some radium. If the  $\gamma$  rays have