resinous lustre. The specific gravity was 4·98. An analysis by Mr. Blake furnished the following results :—

		Per cent.
Thorium oxide	ThO_2	66·26
Cerium oxide (and Cerium earths)	CeO_2	7·18
Zirconium oxide	ZrO_2	2·23
Uranium oxide	UO_3	0·46
Ferric oxide	Fe_2O_3	1·71
Calcium oxide	CaO	0·35
Phosphoric oxide	P_2O_5	1·20
Silica	SiO_2	14·10
Water	H_2O	6·40
		99·89

This mineral is therefore thorite, consisting chiefly of thorium silicate. Both these minerals are under further investigation at the Imperial Institute. Careful explorations are now being made as to the extent of their occurrence in Ceylon.

It is obvious that apart from the scientific interest attaching to the determination of their composition, the discovery in Ceylon of two minerals rich in thoria, now so largely employed for the manufacture of incandescent gas mantles, may be of considerable commercial importance.

Imperial Institute, March 29. WYNDHAM DUNSTAN.

Ionisation of Air.

SOME experiments have been recently made at the Cavendish Laboratory which seem to throw light on the question of the "spontaneous" ionisation of air. The anticipation of a detailed report of these in a short summary of the results obtained may serve some useful purpose by preventing a waste of energy on the part of others who are engaged in investigating the same subject.

The experiments consist in the determination of the saturation current through rectangular vessels, lined with the metal under investigation, the volume of the vessels being capable of alteration by the motion parallel to itself of one of the sides of the vessel. On plotting a curve the ordinates of which are the saturations currents and the abscissæ the distance of the movable side from the side opposite to it, it becomes clear that there are two separate distinct kinds of radiation causing the ionisation of the gas :—(1) a radiation coming from the sides of the vessel which is completely absorbed by some 5 cm. of air, and which, therefore, when the volume is considerable, gives an ionisation proportional to the surface of the vessel; (2) a much more penetrating radiation, which at all volumes gives an ionisation proportional to the volume of the vessel. Further experiments were then made by surrounding the vessel with lead sheets about 3 cm. thick and repeating the determination of the variation of the ionisation with the volume. The lead screen diminished the ionisation; by this method it was possible to discover which part of the radiation suffered diminution.

Up to the present time four metals have been investigated, lead, aluminium, zinc and tin foil. Of these, in the absence of the screen, the first three gave approximately the same value for the penetrating radiation causing volume ionisation. The absorbable radiation causing surface ionisation was greater for the aluminium than for the zinc, and still greater for the lead. When the screen was applied the penetrating radiation was diminished to about two-fifths of its value for all three metals. In the lead and the aluminium the value of the surface ionisation remained unaltered by the screen, but in the zinc this was decreased, and fell to about three-fifths of its original magnitude.

The tin was quite peculiar in its behaviour. The normal volume ionisation was only about one-third of that in the other metals, and when the screen was applied both the surface and the volume ionisations fell in the same proportion to two-thirds of their former values.

It is pretty clear, therefore, that at least in the case of tin and zinc we have secondary radiation given off from the surfaces of those metals under the influence of penetrating radiation coming from outside.

Some numbers may be useful to give an idea of the respective magnitudes of the radiations mentioned. Taking an arbitrary unit, the values for the ionisation caused by one square centimetre of surface of the metals are as follows :—lead 38·6, tin 33, aluminium 10, zinc 7·9. On the same scale the values of the ionisations due to the penetrating radiation in 1 c.c. of air enclosed in a vessel of these metals is for lead, aluminium and zinc between 3·2 and 2·8; for tin it is 0·9.

It is probable that many of the discrepancies that have appeared between the results obtained by different physicists may be explicable by a difference in the metal of which their vessels were composed. For example, it is clear that it might be possible to detect the effect of a screen on a zinc vessel, while in a lead vessel the diminution of ionisation due to the same screen would be inappreciable; similarly, it would be possible to measure in a lead vessel effects due to the surface radiation which could not possibly be detected if zinc were substituted for the lead. Further experiments on different metals, and with other modifications, are in preparation, which it is hoped will throw more light on this interesting problem.

NORMAN N. CAMPBELL.

Trinity College, Cambridge, March 25.

Respiration in Frogs.

Is the buccal cavity of the frog a respiratory chamber? In a letter to NATURE, March 24, Mr. M. D. Hill accepts this conception of it, and yet the only evidence which can be offered in support of this view is the rich blood supply of its lining membrane. The lungs and skin, which are known to be respiratory surfaces, are supplied by a special circulation; the buccal cavity is neither more nor less supplied with blood than the other parts of the alimentary tract, which are certainly not respiratory.

The oscillatory movement of the frog's pharynx, which occurs when the lungs are filled and the opening to the larynx closed, is one of a number of points connected with the respiratory system which have not yet been satisfactorily explained. The other points are :—(1) the evolution of the reptilian method of respiration from the amphibian; (2) the meaning of the laryngeal and bronchial musculature found in amphibians, reptiles, birds and mammals; (3) the closure of the auditus laryngis of the amphibian during the respiratory phase; (4) the attachment of part of the transversalis and rectus abdominis to the pericardium and roots of the lungs; (5) the air in contact with the respiratory surface of the lungs is always very impure. All these points, with the exception of the last, find their explanation in the fact that the act of respiration in all forms of vertebrate life produces two effects within the lungs :—(1) air is drawn into the air spaces; (2) blood is drawn into the pulmonary capillaries. Further, the rate of flow in the pulmonary capillaries, which are situated in the septa between the air cells, is determined by the pressure within the air cells. The air within the lung is used as a brake for regulating the pulmonary flow of blood. That is to say, the act of respiration in reptiles, mammals and birds has two effects, one on the air and another on the blood within the lung. In amphibians these two effects are apparently obtained by separate means.

In the major movement of amphibian respiration the air is forced within the lungs by the muscles of the pharynx and expelled by the contraction of the muscles of the body wall. In both phases of that movement, which are for the renewal of air within the lung, the pulmonary circulation is retarded by the positive pressure of the breathed air. When the lungs are filled and the opening of the larynx closed, the minor movements set in. They vary in different genera of frogs, but taking the noisy frog (*Rana clamata*) as a type in which to observe these movements, it will be noticed that the body wall muscles, especially the transversalis, contract and rather expand the body at the same time as the larynx is drawn downwards. In all Amphibia the larynx, pharynx, and their muscles are so closely bound up with the lung that the pressure of the pulmonary air must be affected by their movement. In short, the oscillatory movements of the pharynx in the Amphibia (and also in turtles and tortoises) create a negative pressure within the amphibian lung, and thus regulate and accelerate the flow of blood through that organ. For that reason