encourage and support every effort in the eradication of all factors detrimental to the progress of humanity, should engage her immediate attention.

The work of educating the public must primarily rest with the educational bodies throughout India. The study of Zoology and Botany, stressing such points as are essential to human welfare should be of vital importance to every boy and girl, man and woman leaving our schools and colleges. Biology should be one of the compulsory subjects in the Primary, Secondary, and even the first two years of collegiate education.

At the recent Matriculation Examination of the Bombay University, out of 17,000 candidates, only 63 offered Zoology and Botany, and 171 Physiology and Hygiene as their optional subjects. The remaining 16,750 students—the majority of whom would perhaps never again come into contact with educational facilities—must plod their tragic way through life with practically no idea of life and its dangers, the cause of disease, its transmission, cure, prevention and eradication.

Imagine 17,000 students facing life's dangers with a knowledge of History, Geography, Algebra, Geometry and Arithmetic. While in no way trying to minimise the value of these subjects, this is only an instance to show how, in the entire exclusion of Biology as one of the compulsory subjects, we have failed to recognise the true values of things.

The universal realisation of the need for Biology in the educational policy of every nation will have a profound and far-reaching effect in the world of the future, when health and prosperity will take the place of disease and poverty.

Lacertilian Respiratory Mechanism.

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THE part played by the buccal floor, and therefore the hyoid and its muscles, in co-operating with the thoracic respiratory mechanism has been minimised if not lost sight of by previous workers like P. Bert, C. Heinemann, E. Siegurt and E. Goppert. An estimate of the exact character and degree of buccal participation in pumping air in and out of lungs is necessary to understand reptilian respiration as a whole and to trace its evolution from the mechanism of pulmonary ventilation of amphibia.

The present note on this subject deals with the respiratory mechanism of only three lizards—a geckon, a varanid and an agamid. The buccal floor of members of geckonidæ rises and falls rhythmically and it can be easily noted that these oscillations are as frequent as the expansion and contraction of the chest. That those movements of the buccal floor are not passive—not the secondary effects of the going out and coming in of air from the lungs—was proved by the following experiment. A Geckon (*Hemidactylus* sp.) was tied down to a board and about 0·3 to 0·5 c.c. of Novocain (Bayer Meister—Lucrius) was injected subcutaneously into the throat region. The trachea was cut when the part was completely narcotised. Movements of the buccal floor continued as regularly and as frequently as those of the thorax, though the air from the thorax could no more enter the buccal cavity. This shows that the buccal floor movements form a feature of the respiratory mechanism as active and primary as the contraction and dilation of the thorax.

It is interesting to watch the buccal floor lower when the thorax dilates and rise when the chest contracts. The fact that the buccal cavity and the thorax contract together furnishes additional evidence to prove that the buccal movements are active and independent of those of the chest. The movements are so quick that the fact that they do not alternate may not be easily detected unaided. To facilitate observation the following apparatus was devised. A lizard was tied down to a board with the ventral side upwards. Small strips of glove rubber glued to the lower ends of pieces of wires were placed, one on the chest and another on the buccal floor. The upper ends of the vertical wires communicated the movements to the short arms of long light wooden levers. Each lever had a knife edge fixed to it, and this knife was allowed to rest in a 'V' shaped groove of a wooden piece clamped to a stand. The lever was perfectly counterpoised about the fulcrum and care was taken

that the lever did not exert too much pressure on the buccal floor. When the buccal floor (or the chest wall) rose and fell, the tips of the levers dipped down or tilted up. A thin copper wire was previously wound round the long arm of each lever from the fulcrum to the tip. The free end of the wire at the tip of the lever was made to just touch another piece of copper wire (fixed to a stand) whenever the tip of the lever was lifted. The other ends of these two wires were connected to the poles of an electric battery so that a circuit was completed whenever the free ends of the two wires touched. Electric bells were introduced into the circuits and their sounding facilitated the observation of the synchronous movements of the levers connected to the buccal floor and the thorax. Later styles were fixed to the hammers of the two electric bells and their vibrations were recorded on smoked paper revolving round two drums. The record obtained showed that the contacts made by the levers connected to the buccal floor and to the thorax were simultaneous. This method of recording the buccal and thoracic movements had to be resorted to because the mouth floor and chest wall movements appeared too weak for ordinary graphical records.

The above experiments clearly show that the buccal cavity and the thorax contract together and dilate together and that these movements of the buccal and thoracic wall are both active and due to the effort of independent muscles. The rôle the buccal floor plays in the respiratory mechanism appears to be this: Owing to the weak character of the muscles of the buccal floor, the strong contraction of the thorax, expelling air from lungs would bring about the inflation or lowering of the mouth floor. When next the thorax relaxes the air inspired would be this impure air in the buccal cavity especially when the thoracic contraction and expansion follow each other so rapidly. This is avoided by the active and simultaneous contraction and expansion of the mouth floor. When the thorax contracts, the tongue and floor of the mouth are raised up through the aid of the transverse and hyoid muscles and the vitiated air from the lungs is thus expelled direct.

In calotes and varanus, however, the buccal cavity appears to participate only during the extraordinary respiratory movements. If a calotes or varanus were tied down to a board with the ventral side upwards and if the throat region were watched carefully, it will be seen to move very slightly. These movements, however, alternate with those of the thorax. If a thread is stitched through the skin in this region and attached to a pin driven close to the fulcrum of a lever (described before) these movements can be recorded. That these movements are passive and secondary and due to the air going out and coming into the thorax, can be proved by cutting the trachea after narcotising the region by a subcutaneous injection of novocain. The movements cease. A little later, however, when this operation brings on laboured respiration the buccal movements can be seen to be spasmodic and vigorous and to synchronise with the movements of the thorax. The same result could be obtained by plugging the nostrils of a calotes with wax or by tying the thorax with a piece of twine and thus restricting its movements. By means of levers which have styles attached to their tips, the movements of the mouth floor and thoracic wall were recorded on smoked paper. The graphs showed that the mouth floor and chest wall contracted or expanded together during laboured respiration. (While these records were made, the mouth of the calotes was kept open by a piece of stick thrust between the jaws. By this means the expired air was prevented from affecting the buccal movements.)

What little passive dilation and contraction there can be seen in normal breathing is apparent only in the back part of the throat and is confined to a very narrow area of it because of the thick muscles of the hyoid and buccal floor. As the disadvantage of a thin walled, easily inflated and deflated buccal cavity is thus obviated, the buccal floor does not perform any movement during normal respiration. During laboured respiration, however, the buccal floor and tongue being elevated makes the expired air go completely out of the body, while their being depressed during the expansion of the thorax, facilitates the sucking in of fresh air.