

LETTERS TO THE EDITOR.

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Atomic Energy.

REFERRING to the notice of my recent Trueman Wood lecture on p. 420 of NATURE of December 25 last, let me explain that I admitted that we could not at present tap or utilise intra-atomic energy except what is given us spontaneously. But we may claim to be utilising intra-atomic properties, since without some kind of disintegration the right kind of projectiles would not be available. I say clearly in the lecture "it is atomic properties rather than atomic energy that are at present being utilised" in wireless telephony.

Furthermore, although the excitation of healthy retinal nerves is primarily dependent on the energy of incident light, yet the action is as if the atoms of a retinal substance acted as accumulators, storing up an æther disturbance of quite unphysiological frequency until a quantum has been collected, when a stimulating projectile is liberated. If anything like this happens, the energy actually utilised is atomic energy; for if that had no existence, the light-waves would be powerless. There may be pathological cases where optic-nerve stimulus is independent of received luminous energy, but that is a highly undesirable state of affairs.

OLIVER J. LODGE.

Metamorphosis of Axolotl caused by Thyroid-feeding.

THE fact that a diet of mammalian thyroid will induce frog-tadpoles to metamorphose precociously into the adult form is now well established. It is of some interest to find that this diet produces a similar effect in a form which usually does not metamorphose—the Axolotl. This is the larva of a salamander known as *Amblystoma*, but is remarkable in being neotenic, i.e. it normally fails to metamorphose, and attains full size and sexual maturity while keeping its larval characters. Chief among these are the external gills and the fin along the back and both borders of the tail, but the adult also differs from the larva in colour, in shape of head, in the development of eyes and eyelids, in the rounded form of the tail, and, of course, in the use of its limbs for progression on land.

Marie von Chauvin in Germany (*Zeitschr. f. Wiss. Zool.*, vol. xxvii., 1877, and vol. xli., 1885) and E. G. Boulenger in this country (*Proc. Zool. Soc.*, 1913 (2)) have succeeded in getting Axolotls to assume the adult form by forcing them to breathe air, either by keeping them in damp moss or in a gradually diminishing quantity of shallow water.

In conjunction with Mr. D. F. Lenev, I have been trying the effect of thyroid diet on Axolotls. Two young specimens, 11.5 cm. and 12.7 cm. long, and therefore presumably between six and twelve months old, were kept in a tank at an average temperature of 15°–16° C. in a depth of water (more than 2 in.) considerably greater than that needed to induce air-breathing. They were fed on ox thyroid, at first three times, and later twice, a week.

The thyroid diet began on November 30 last. On December 15 distinct alterations were visible in colour and in resorption of gills and fin, and on December 17 the stage which is critical in metamorphosis induced by air-breathing (see Boulenger's paper) had been passed, the animals being in Boulenger's stage 6,

with only vestiges of gills and fin. On December 19 the next or penultimate stage, with scarcely a trace of larval characters, was reached. The larger specimen, the metamorphosis of which was slightly more advanced, had climbed out of the water up a platform provided for the purpose, and its skin was as dry as an ordinary salamander's. When placed on the table they both walked well, thus differing markedly from the larva, which cannot use its legs efficiently if placed on land. Curiously enough, on the succeeding day the larger animal had returned to the water, where it remained until December 23. It then again left the water of its own accord, and up to the time of writing (December 24) has remained in air. Two other specimens of similar size, fed on worms and kept in shallow water, according to Boulenger's method, have so far shown only minimal changes.

Two points are of special interest. First, the time of metamorphosis—just over three weeks—is much shorter than any previously recorded. Boulenger's larvæ took from twelve to sixteen weeks, Marie von Chauvin's from seven to forty weeks. Secondly, the "critical stage" in the metamorphosis was reached apparently without the animals breathing air at all; i.e. two entirely different causes, forced air-breathing and a thyroid diet, can produce the same result—metamorphosis. It was not until December 19 that they were observed to come to the surface for air; and even after that, although possessing no functional gills, they spent much time at the bottom of the water, only occasionally rising to float suspended close below the surface with limbs outspread, after the fashion of newts.

Many interesting problems present themselves, which it is hoped to work out as opportunity offers. Meanwhile, this note is published in the hope that others who possess Axolotls will repeat and develop experiments along these lines. I should be glad to enter into correspondence with anyone intending to work on the subject, with the view of preventing useless overlapping in the working out of the problems that arise; and, further, I should be very grateful if anyone possessing Axolotls, whether young or old, would give me the opportunity of purchasing some, as they are at present very difficult to obtain in the market.

JULIAN S. HUXLEY.

New College, Oxford, December 24.

The Hibernation of the House-fly.

M. DE SEGUY's discovery of larvæ of *Musca domestica* in the bodies of snails, Dr. J. C. Gahan's observations thereon in the *Times*, and the note in NATURE of December 18 last are very interesting to biologists, but it is most improbable that a winter crusade against the *Helicidæ* would have any appreciable effect in diminishing the summer swarms of flies.

I am led to this conclusion by circumstances under my immediate observation. Round my house is a large flower-garden in which I work constantly at all seasons, desperately worried in summer by legions of house-flies. In the course of forty years I have never come across one of the larger *Helicidæ* in this garden; and my head gardener, a very intelligent man and a good observer, assures me that in thirty years he has never seen one in the kitchen-garden, which is distant half a mile from the flower-garden. Slugs abound in both, but the only one of the *Helicidæ* that is found is a very small species with a thin, flattened shell (? *Helix cellaria*, Müller) and a body too small to accommodate the larva of a house-fly. It is also the reverse of abundant. There must,