stage nymphs of a related species (*Blatta orientalis*) was measured at intervals until after the animals had moulted and become adult. The Barcroft apparatus was used at 25° C.[1]

	Number of observations.	Average oxygen consumption in mgm./gm./day, and standard error.
11th to 2nd weeks before the moult	29	9·0±0·18
Day of moult and 3 days following	21	14·3±0·37
2nd to 4th weeks after the moult	26	10·4±0·20

Average live weight per animal = 325 mgm.

Ten animals were used, but in only four cases was it possible to carry out an experiment on the actual day of the moult. In these cases the average oxygen consumption was 16·5 mgm. per gram live weight per day, and the rate fell after that day. The accompanying table summarises the results obtained, the figures for the week before and the last four days of the week after the moult being omitted in order that the difference between the periods chosen may be clearly seen. The difference between the rates 'during' (that is, day of moult and three days after) and after the moult is more than nine times the standard error of that difference. The difference between the rates before and after the moult is also quite significant.

Little is known about the internal histological and metabolic changes which take place during the post-embryonic development of exopterygote insects, though they are not nearly so great as the changes accompanying metamorphosis in the Endopterygota[2]. The external skeleton is, however, partly digested and partly shed and a new cuticle is laid down in its place[3]. It is to this process of moulting alone, in the absence of further information, that we may ascribe at present the additional oxygen consumed at this period.

D. L. GUNN.

Department of Zoology,
University,
Birmingham.
Feb. 8.

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Collision Frequency and Molecular Density in the F_1 Layer of the Ionosphere

RECENT measurements of the reflection coefficient of the ionosphere, for radio waves between 60 m. and 100 m., have led to a method of determining the collision frequency of electrons and molecules in the region where the ionisation density of the F_1 layer is a maximum. This is, roughly, at a height of some 200 km. above the earth's surface.

The pulse technique of Breit and Tuve was used, and simultaneous records were made of the equivalent height and reflection coefficient of the ionised regions. At certain times the equivalent height rose rapidly to a great value and then decreased again. Simultaneously, the echo intensity decreased to a minimum and then increased again, the minimum intensity corresponding with the maximum equivalent height.

An example is shown in Fig. 1. Such results are interpreted on the supposition that, at the time of maximum equivalent height, the actual frequency ν of the emitted waves is very close to the maximum critical frequency ν_0 of the F_1 region. In such conditions, the extra attenuation shown by the dip in the curve (2) is caused by the collision of electrons with molecules which occur in the neighbourhood of the F_1 ionic density maximum.

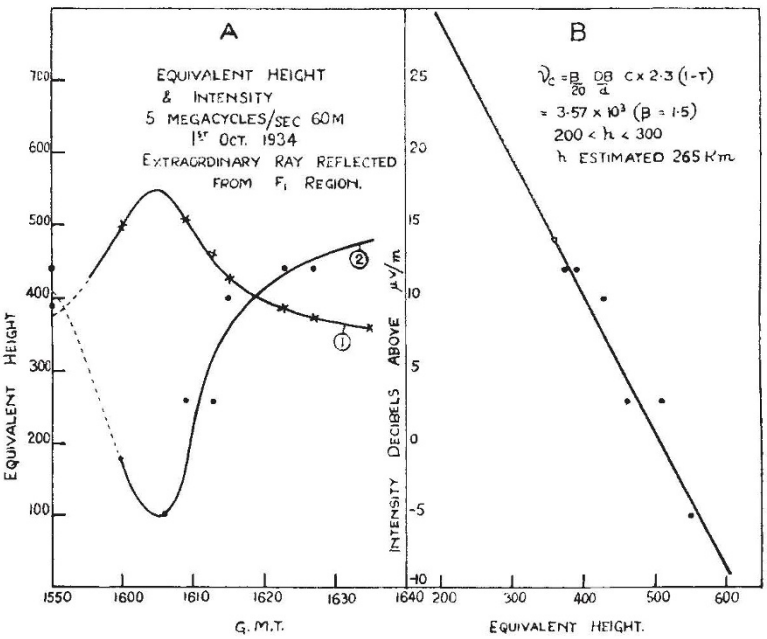

FIG. 1.

The reflection coefficient, in this case, can be shown to be $e^{-t/\beta\tau_c}$ for the ordinary ray, and $e^{-t/\beta\tau_c(1-\tau)}$ for the extraordinary ray, and this is true for vertical incidence whatever the direction of the terrestrial magnetic field. τ_c is the mean time between successive collisions of an electron with the molecules of the atmosphere, $\tau = eH/2\pi m\nu$, and β is a constant[1] equal to $\frac{3}{2}$.

Thus there should be a linear relation between the log intensity and equivalent height (proportional to the delay time t). This is illustrated in Fig. 1, *B*. The slope of this line will then give the collision frequency ν_c. In the example illustrated in Fig. 1, $\nu_c = 3{\cdot}6 \times 10^3$ for an estimated height of 265 km.

The determination of ν_c involves no other quantities than the relative intensities and delay time t, which can be measured with a fair degree of accuracy.

T. L. ECKERSLEY.

Research Department,
Marconi's Wireless Telegraph Co., Ltd.,
Chelmsford.
Jan. 30.

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