My own limited experience supports those who take this view. In the case of *Orgyia turbata* Butler (Corbett and Dover[3]), on which observations were made by the Government Entomologist, F.M.S. and S.S., and his staff, it was found that a heavy mortality occurred among caterpillars fed on *Crotolaria* (a plant to which they were not accustomed), but that those which survived completed the larval period sooner and with less moults than those fed on *Mimosa*, the favourite food-plant of the earlier instars. It seems, therefore, that diminished metabolic activity, consequent on an unpalatable food-supply, accelerates the completion of the larval period, probably because there is a lesser accumulation of waste nitrogenous and carbonaceous matter, the elimination of which, as suggested by Eisig and Sharp [4], is assisted by ecdyses. Moreover, "a quick life-cycle would increase the possibility of the larvæ surviving the disadvantages occasioned by unhealthy food". These opinions are of interest, not only because they partially contradict the views of Pruthi and others (while supporting the fundamental hypothesis that moulting is more intimately connected with general metabolism rather than with growth), but also because they suggest that "an insect which has once gained a foothold on a plant which is commonly supposed to be unpalatable may be more numerous than on more favoured food-plants", at least during the initial stages of adaptation.

How can the difference between the above observations and those of Pruthi be explained? The answer probably lies in the fact that in all his partial starvation experiments starvation was intermittent, while in the case of *Orgyia turbata* fed on *Crotolaria* the food-supply was apparently unpalatable, and was not partaken of so freely as was *Mimosa*: there was a reduction in the quantity of food taken, but there were no periods of starvation followed by normal feeding. The interpretation of Pruthi's results, therefore, appears to be that a comparatively lengthy period of starvation, followed by an equal period of normal feeding, disturbed the metabolic rhythm to the extent of retarding growth. The increased number of moults observed in his intermittently starved larvæ can be explained by Eisig and Sharp's theory, for the nature of the feeding permitted to them must have resulted in an excessive accumulation of waste products which ecdyses helped to eliminate. If these explanations are accepted, it will be seen that Pruthi's results are brought more into line with the proposition that, in many cases, an unpalatable and reduced food-supply accelerates the completion of the larval period. The problem is, however, a controversial one, and is of both biologic and economic interest. Further investigations should therefore be of value.

CEDRIC DOVER.

[1] Pruthi, *Brit. Jour. Exp. Biol.*, **8**, 1; 1925.
[2] Pruthi, NATURE, Dec. 26; 1925.
[3] Corbett and Dover, *Malayan Agric. Journ.*, **15**, 7; 1927.
[4] Sharp, "Camb. Nat. Hist.", Insects, **1**, p. 163; 1901.

Excitation of the Green Auroral Line.

THIS note will be of special interest when compared with my paper on the light of the night sky, published in a recent number of the *Physical Review*, and with my report before the Pasadena meeting of the American Physical Society, in which I reported the first effectively complete reproduction of the aurora spectrum. On many of the spectra which were photographed during the progress of the above-mentioned experiments, it was thought that there were definite, though weak, indications of the presence of the green auroral line. The failure of the green line to appear with considerable intensity in these experiments was never considered to be serious, since there was ample evidence for the occurrence of collisions between excited nitrogen molecules and metastable oxygen atoms in the states which are involved in the emission of the green line. Since the state on which the green line originates is metastable, it is not at all surprising that the line was either absent or missing in these experiments.

In my most recent experiments, on raising the pressure from 10^{-3} mm. to about 5 mm. by admitting oxygen to the tube in which the auroral spectrum was reproduced at the lower pressure, it was found that, so far as the excitation of oxygen was concerned, the tube behaved very much as it did at the lower pressure. Now at 10^{-3} mm. it was often possible to obtain a large decomposition of oxygen molecules into atoms, without the appearance, however, of the arc spectrum of oxygen. The presence of atoms in great numbers was indicated by the incandescence of small bits of oxide (as in atomic hydrogen) and also by strong heating of small patches of the tube wall. Now the production of oxygen atoms, under conditions where no arc lines (other than the green line) are produced, arises both in the aurora and in the night sky. Because of the marked resemblance between the low-pressure tube and the high-pressure tube, a photograph was taken of the spectrum of the high-pressure tube and a fairly strong excitation of the green line was observed. Other plates showed that when the arc lines of oxygen increased in intensity the green line decreased in intensity, which indicates that the process by which the green line is excited in these experiments is one which does not excite the arc spectrum. Such a process is discussed in some detail in my paper on the light of the night sky.

It is believed that the process of excitation of the green lines is the same in both the high-pressure and the low-pressure tubes, but that at high pressures the green line is emitted because collisions with the wall or with nitrogen molecules are less probable in view of the diluting effect of the added oxygen. It is also possible that the lifetime of the metastable oxygen atom which emits the green line is less at high pressures than at very low pressures in view of the close proximity of excited atoms and molecules.

It is important to note that the green line was excited in the present experiments without the use of rare gases. Practically all other laboratory reproductions of the green line have been made with the help of rare gases. Fuller discussion of the present work will show that the present excitation of the green line and the rest of the auroral spectrum is probably the one that occurs in Nature, and furthermore, it is a phenomenon in which only oxygen and nitrogen are involved. For that reason the present experiments should have a direct bearing on the problem of the origin of auroral displays.

JOSEPH KAPLAN.

University of California at Los Angeles,
July 18.

The Slow Combustion of Methane and Ethane.

THE observations referred to by Prof. W. A. Bone in NATURE of Aug. 1 (p. 188) with regard to the source of alcohols in the combustion products of paraffin hydrocarbons were based on experimental evidence accumulated in Great Britain and other countries from the point of view of the peroxide mechanism of combustion; compare, for example, in the case of methane, the work of Wartenburg and Sieg,[1] who concluded that methane first forms the moloxide $CH_4(O_2)$. It is interesting to note that the earlier supporters of the peroxide theory of oxidation had discovered the presence of alcohols in the oxidation