but gives a good idea of the fluctuations in daylight. One of the General Electric Co.'s new red-sensitive cells might be used instead, as it is sensitive throughout the visible spectrum, and gives a suitable current. Its infra-red sensitivity would, however, constitute a drawback.

The smooth graph marked A on the accompanying figure shows the record obtained for Dec. 19, starting from 10 A.M. The recorder gives one dot per minute, but where the light was changing in a regular manner dots have been omitted in the figure. The sunshine recorder about 100 yards away showed 7 hr. 0 min. for Dec. 19; the sky was cloudless with a moderate south-south-east breeze. The irregular graph shows the variations in light for the whole of Dec. 20, which was a dry day with a south-west wind of 10-15 m.p.h. The sunshine record was zero, but the sun nearly broke through at 11.40 A.M., and the vertical illumination then exceeded that of Dec. 19 with clear sun. The cross at noon denotes the dot obtained on Dec. 19 by shading the photometer from the direct rays of the sun and is a measure of the diffuse light. The ratio of total vertical to vertical diffuse light was thus found to be 1·49. At noon in midsummer this ratio, β, measured in the same position with a similar and similarly mounted sodium cell was, as a maximum, 4·28, a more usual value being about 3·3.

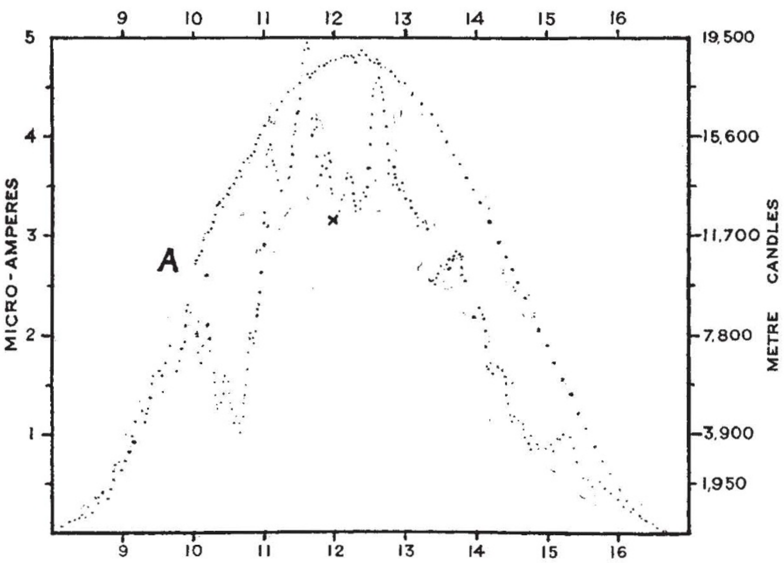

FIG. 1.—The regular curve shows the vertical illumination for Dec. 19, 1929, starting from 10 A.M., marked *A*. The irregular curve is the record for Dec. 20. For cross see text. The left-hand ordinates are micro-amperes, the right-hand are metre candles, while the abscissæ are hours. The charts are marked in quarter hours and tenths of a micro-ampere.

The ordinates on the right-hand side of the figure show metre candles, the photometer having been standardised against an open carbon arc—selected as being the source most nearly akin to daylight and easily reproducible.

We hope by means of these records to be able to correlate plant growth with daily illumination in metre-candle hours. The cost of the thread recorder was defrayed by the Government Grant Committee of the Royal Society.

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Jan. 22.

The 'Wave Band' Theory of Wireless Transmission.

Two obvious objections can be made to Sir Ambrose Fleming's lucid analysis of the wave band theory in NATURE of Jan. 18.

The first is theoretical. To deny the reality of the wave band method of regarding a modulated carrier-wave is at bottom much the same as to deny that a point on the rim of a rolling bicycle wheel 'hops along' in a series of cycloids. In both examples the two alternative points of view have equal rights to the name 'real'.

The second is practical, and so may justify this letter. Two stations operating on frequencies, say, of 500 and 520 kilocycles, will not give a noticeable heterodyne note, as their beat-frequency of 10,000 is too high for the average loud-speaker to reproduce effectively. But if one of them modulates its carrier-wave by a soprano solo, bad heterodyning results every time the soprano emits a high note. The fluctuating-amplitude formulation does not lead us to expect this off-hand; the wave band formulation does. In practice, therefore, the latter is likely to hold its own.

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SIR AMBROSE FLEMING does not give us in his very able article any alternative explanation of the fundamental problem of the tuned circuit, namely, that the really selective circuit *does* cut off the higher audio frequencies, generally explained by the 'cutting of the side bands'. What is actually happening? Does not the solution lie in the fact that the damping of a resonant system falls off as its selectivity increases? In our modern lightly damped receiver, the oscillation persists long after its excitation has ceased. If it is excited by a carrier modulated by a high audio frequency, the persistence of its vibrations will not allow the amplitude of these to vary with the modulated amplitude of the incoming wave and the modulation gets flattened out, whilst with a low modulating frequency, or bass note, the slower rise and fall of the carrier amplitude gives time for the circuit oscillations to rise and fall with it and thus give a faithful reproduction.

So the lightly damped circuit gives a gradual falling off in intensity as we go up the scale of audio frequencies; the lighter the damping the earlier this becomes noticeable, until in the limit all audio frequencies would be 'cut off' as the 'side band' theory has it. Either theory explains this, the cause of all the trouble in the ether, but, whereas the latter suggests that the defect is inherent however real selectivity is attained—that is, response only to the carrier vicinity—the former suggests that if some other means of selectivity than the lightly damped circuit could be found—even with response to the carrier alone—there is no reason why the modulation should not be faithfully reproduced. The 'side band' theory puts the onus on the wave itself, the amplitude idea on the receiver; the former closes and bolts the door, while the latter leaves it open for exploration