

## Measurements of the Velocity of Light

M. E. J. GHEURY DE BRAY suggests<sup>1</sup> that measurements of the velocity of light show that it is changing according to a formula :

$$c = 299,900 - 3.855 T, \quad (1)$$

$T$  being measured in years from 1900.

Assuming that Planck's constant and the energy  $E$  given out by an excited atom remain unchanged, the relation

$$E\lambda = ch \quad (2)$$

shows that a change in  $c$  must be accompanied by a proportional change in  $\lambda$ . But the wave-length of the red calcium line has remained constant to within one part in five million for thirty years, only 0.5 per cent of the change required by (1).

It is probable that there are unsuspected systematic errors in the determinations of  $c$ .

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THE decrease of velocity of light deduced from the red-shifts is of the order of 1 km./sec. in 6,000 years, or 1 in 600,000,000 for thirty years, which is quite consistent with the apparent constancy of the wave-length mentioned by Lord Kitchener. Our observations, being affected by unsuspected systematic errors, and covering only a third of a century, give

what is probably a greatly exaggerated rate of slowing down. The remarkable fact is that *all* the determinations are unanimous in indicating the existence of such a variation, and the red-shifts, if interpreted so as to escape from fantastic results, confirm it.

The Table 1 of the communication referred to cannot be dismissed on the ground of "unsuspected systematic errors". It is admitted that the method of the revolving mirror may suffer from physical bias, but no such reproach can be levelled against the toothed wheel method, which is only open to objections of a physiological nature. These can be readily overcome by substituting for the observer's eye a photo-electric sensitive device. While France and the United States share between them practically the whole initiative in the measurement of  $c$ , Great Britain has only to her credit a conspicuous failure. Is there in this country no one who can redeem it from this position and settle this question, which lies at the basis of physical science, considered in its broadest aspect?

Two observations, of Newcomb (1882.7 : 299860) and of Michelson (1882.8 : 299853) agree so closely that, if we consider that they were made by different observers, working independently with different instruments and different techniques, in different places, they must be extremely accurate, despite their large probable errors. It is significant that the second in date gives a lesser value of  $c$ .

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## Points from Foregoing Letters

L. G. Grimmett and G. V. B. Herford describe an experiment to test the possibility of controlling insect pests by means of radiation, in which it appeared that grain weevils (*Calandra granaria*) were sterilized by a radiation dose of  $\beta$ - and  $\gamma$ -rays estimated at  $10^5$  röntgens.

Injection into rats and mice of intercellular wound hormones, produced by injuring tissue cells with lethal ultra-violet, was found to produce local overgrowths, in investigations of J. R. Loofbourow, A. A. Cueto, D. Whalen and Sister M. M. Lane. The tumours were composed mainly of connective tissue and striated muscle.

G. P. Wells discusses the frequent occurrence of intermittent rhythmic activity in isolated preparations from polychaete worms.

J. Fisher describes the distribution of the colour-phases of *Fulmarus glacialis*, and shows the existence of a polymorph-ratio cline. The dark types are most numerous in the neighbourhood of south and east Greenland and west Spitsbergen, and fall off in proportion northwards towards Baffin Bay, and southwards towards the Newfoundland Banks and the British Isles; in the latter they constitute less than 2 per cent of the population.

C. Crossland expresses dissatisfaction with the working of the rules for zoological nomenclature, on the grounds that the present methods of making *nomina conservanda* are too cumbersome, and he proposes an alternative method. He points out that the work of the systematist is not an end in itself, but

exists that workers in such subjects as ecology and genetics may, with rapidity and certainty, find out what is known of the species' structure, relationships, distribution and ecology; any interference with the literature which hinders this end should be discouraged.

P. J. G. Mann and J. H. Quastel show that benzidine stimulates the oxygen uptake of brain *in vitro*, when this respire in the presence of certain amines. This is accomplished by an inhibition of the formation in brain of toxic aldehydes.

An investigation is reported by J. I. Cohen in which factorial methods of analysis, as used in psychometry, are applied to anthropometric measurements. The results suggest that physique may be regarded as determined by two sets of processes, one governing growth (or size) in all body dimensions and the other, relatively independent of the first, governing specifically linear or circumferential development.

Lord Kitchener shows that, with certain assumptions, a large secular change in  $c$  is inconsistent with the observed constancy of spectral wave-lengths. M. E. J. Gheury de Bray points out in reply that the decrease of velocity of light deduced from the red-shifts is 1 in 600,000,000 for thirty years, which is not inconsistent with the apparent constancy of the red calcium line. It is suggested that the toothed-wheel method in combination with a photo-electric sensitive device should be used to re-determine the velocity of light.