ference fringes are localised. Generally $D^1 = D$, that is, the telescope is focused on the surface of the end mirror; in such cases the formula becomes:

$$\Sigma = \frac{D\xi^2}{\lambda} \cos 2\alpha + \mu \frac{D\xi^2}{\lambda} \cos 2\alpha. \qquad (2)$$

The first term here represents the Michelson effect; the others show that a supplementary effect of amplitude proportional to the angle μ, or to the number of fringes visible in the field of view, may also be expected. But such an effect is (*a*) of half-period like the Michelson effect, (*b*) of amplitude μ ($\sim 2 \times 10^{-5}$) times less, so that any possibility of an experimental verification is out of the question.

The full period effect shown by interferometrical experiments *cannot be in any way justified by the classical ether drift theory*. It is therefore the more important to know more thoroughly the characteristics of this effect, which may be deduced from the rich observational material collected by Miller. It may be either systematic perturbations introduced in the elaboration of the results of observation, or a phenomenon depending on another cause varying with the rotation of the interferometer, perhaps the same that causes the difference between the results obtained by Miller and others who have experimented on the Michelson effect[5], and the unexplained anomalies that it represents[1].

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Photography of the Infra-Red Solar Spectrum to Wave-length 12,900 A.

WITH the aid of the new Agfa infra-red sensitive plates (maximum of sensitivity 10,600 A.) I have succeeded in photographing the solar spectrum to 12,900 A. in the first order of a 3 m. grating (dispersion 5 A./mm., time of exposure 10 hours). The blackening of the exposure obtained does not alter appreciably from 12,400 to 12,900 A. (end of the plate used), so that it seems easily possible to extend the limit quite considerably.

The plates so far obtained show the water vapour absorption band at 11,300 A. well resolved into its fine structure lines and extending about 1000 A. to both sides. It exhibits the same sort of complexity as the shorter wave-length bands photographed and analysed by Mecke and his co-workers[1], but is much more intense.

In addition, there is a very interesting *atmospheric oxygen band* between 12,500 A. and 12,750 A., also, of course, with very well-resolved fine structure. This band has already been observed with ordinary infra-red apparatus and low dispersion by Ellis and Kneser[2] in the infra-red absorption spectrum of *liquid* oxygen together with other bands, and they have identified it with a weak maximum in Abbot's bolometer curves of the solar spectrum. That this band is really due to the oxygen molecule and represents the 'forbidden' transition from the ground-level $^3\Sigma_g^-$ to the low $^1\Delta$-level first predicted by Mulliken[3] is rigorously proved by a preliminary fine structure analysis. The observed structure shows that the selection rule $\Delta J = 0, \pm 1$ still holds for $^1\Delta - {}^3\Sigma$; but besides $\Delta K = 0, \pm 1$ (*P*, *Q* and *R* branches), transitions with $\Delta K = \pm 2$ occur with about equal intensity (*S*-form and *O*-form branches). The band on the whole is very much weaker than the ordinary atmospheric oxygen *A*-band at 7600 A., in agreement with the expectation that a $^1\Delta - {}^3\Sigma$ transition is more strongly forbidden than $^1\Sigma - {}^3\Sigma$. Preliminary constants for the $^1\Delta$-level are $\nu_0 = 7881{\cdot}6$ cm.$^{-1}$, $B_0 = 1{\cdot}415$ cm.$^{-1}$, $r_0 = 1{\cdot}220$ A. A value for the vibrational frequency cannot be given because the 1–0 band observed by Ellis and Kneser at 10,600 A. in liquid oxygen does not occur in the solar spectrum.

A full account of this work will appear elsewhere.

In conclusion it is a pleasure to acknowledge the kindness with which the firm of Agfa placed their remarkable new plates at our disposal.

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April 10.

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Velocity of Light

M. E. J. GHEURY DE BRAY has directed attention to an apparent decrease in the velocity of light[1]. I have recently tried to explain this on the basis of the theory of the expanding universe. If the speed of light is a true constant, independent of any variation in our unit of length, then a doubling of the radius of the universe should cause the *measured* velocity of light to diminish by half. If the radius of the universe doubles every *K* years, then the velocity of light will be proportional to $(\frac{1}{2})^t$ where *K* is the unit of time. Thus, the logarithm of the measured velocity of light must be a linear function of the time. I determined the two constants of such a function from de Bray's data and found that it represented the observations in a satisfactory manner. I then solved this equation for the length of time it would take the velocity to diminish by half. The time is of the order of 60,000 years, which is considerably shorter than the value derived from a study of the recession of the external galaxies[2]. Consequently, this observed variation cannot be explained by the expanding universe theory unless we assume that the rate of expansion is much more rapid in the vicinity of the earth than it is at the distance of the spirals.

It is also possible that the variation is not a continuous decrease, but is a periodic function of the time. A rough graphical analysis shows that the observations are well represented by

$$V = 299{,}885 + 115 \sin 2\pi/40\,(t - 1901).$$

The largest deviation is 21 km./sec. and the others are all under 10 km./sec. It is possible that these residuals could be improved by further adjustment of the constants.

Unfortunately, the only evidence for a periodic variation is the observations in 1879·5, 1882·7 and 1882·8. These observations were made over short base lines, and are presumably not as accurate as those made over longer base lines. If we reject them, as we may feel justified in doing, then the