principle as indicated by Lyttleton and Bondi, and ρ_m and τ (and hence U) are also determinate from astronomical observations. It follows, therefore, theoretically that α can be found, and hence the present rate of production of matter.

The observations made at time t of matter at a distance R, will refer to the matter at a time $t - R/c$. It follows, therefore, that the observed mass density at a distance R is:

$$2\varepsilon_0 m^2 \frac{e}{e^*} \frac{\alpha - 1}{(\alpha\tau - R/c)^2} = \rho_0 \left(1 - \frac{R}{\alpha c \tau}\right)^{-2}$$

where ρ_0 is the local mass density at present. Also the observed recession velocity is:

$$\frac{\alpha R}{\alpha\tau - R/c} - \frac{R}{\tau}\left(1 - \frac{R}{\alpha c\tau}\right)^{-1}$$

Both these quantities, the observed mass density and the observed recession velocity, are in principle obtainable (albeit the experimental techniques are not good enough at present) and so α is obtainable in principle, and a test of this theory will be possible once the data are known with sufficient accuracy.

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ASTRONOMY

The Alpha Virginis (Spica) Nebula

An extensive ultra-violet nebula surrounding Spica has been reported by Kupperian, Boggess, and Milligan[1]. Their rocket-borne photon counters yielded an isophotal map of roughly circular extent 22° in diameter, increasing in brightness from the outside towards Spica but reaching the instrumental saturation-level for the central area. If the nebula were due to Lyman-α radiation it would be reasonable to assume that H_α should also be detectable, but no nebula has ever been detected by conventional photographic means. This may have been due to the fact that the strong image of Spica drowns the faint nebula close to the star. On the red plates of the Palomar Sky Survey, the over-exposed image of Spica covers more than 10 min. of arc, while on the blue plates it is nearly three times larger in diameter. The spectrum of Spica itself does not show H_α in emission[2].

Recently, Johnson[3] reported negative results in H_α of the nebula by means of direct and spectroscopic exposures centred on the brightest ultra-violet isophote about 10 min. of arc west of Spica.

In order to examine the area immediately surrounding the star a number of long exposures have been taken during the past 18 months by means of a novel device which might be called a 'stellar coronagraph', attached to the 30-in. refractor at Allegheny Observatory. This device, to be described in detail in a later communication, prevents the stellar image from reaching the emulsion and obscures a circular area 1 mm. (14·6 sec. of arc) in diameter at the focal plane, thus completely eliminating the over-exposed stellar image and halation pattern. To cover the range of H_α, Eastman 103*a*-*E* plus Corning 2403 filter was exposed to a limiting stellar magnitude of $m_{pg} \approx 17$. A few blue exposures on 103*a*-*O* without filter were also taken. The useful field is only 6 × 8 min. of arc with the 14·6 sec. diameter blank space at the centre. None of the exposures reveals any trace of nebulosity.

This method looks promising for detecting circumstellar envelopes and faint companions close to bright stars and should yield best results on large reflectors with large plate scales.

It is a pleasure to thank Dr. N. E. Wagman for making the telescope available for these studies.

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GEOPHYSICS

Height of Night-time *F* Layer Irregularities at the Equator

It has been established by observations at low latitudes that there exists near the equator a belt in the *F* region in which large irregularities in electron density give rise to equatorial spread *F*[1] severe radio star scintillations[2] and the scatter of radio waves[3]. Work by Hewish[4] and Briggs[5] on extra-terrestrial radio sources shows how the height of the irregularities may be inferred from observations of the diffraction pattern on the ground. But the methods used are rather indirect, and therefore subject to some uncertainty. More recently Cohen and Bowles[6], using radar techniques, arrived at an estimation of irregularities of height for equatorial locations. It is not certain that these irregularities are to be identified with those responsible for satellite and radio star scintillation.

Work on these disturbances now being pursued at University College, Ibadan, and at the University of Ghana, Accra, shows that the irregularities in the pattern on the ground are elongated in the direction of the Earth's magnetic field, that the axial ratio is greater than 6:1, and that the smaller dimension is of the order of 0·5 km. (J. R. K. and G. S. K., unpublished). These results are deduced from the study of satellite and radio star transmissions through the disturbed region. It is desirable to determine the heights of the irregularities by a direct method. The procedure adopted consists in the observation at two separated stations of the diffraction pattern produced on the ground when the radio transmissions from an Earth satellite pass through the irregularities. The velocity of the pattern over the ground is determined, and by relating this velocity to the known height and velocity of the satellite, it is possible to determine the effective height of the diffracting screen. Since the velocity of drift of the diffracting screen itself is known to be of the order of 150 m./sec. (J. R. K., unpublished) it can be neglected without introducing an appreciable error.

The observations were made at Legon, near Accra, Ghana (5° 38′ N.; 0° 11′ W.), and the satellite used