

estimate of the density of visible stars in the neighbourhood of the solar system is  $10 \times \text{sun's mass in a sphere of 5 parsecs radius (525 parsec}^3)$ , i.e.  $0.019 \times \text{sun's mass per parsec}^3$ . It follows that the density of "uncondensed" or "residual" matter existing in interstellar space is of the order  $10^5$  that of "condensed" stellar matter. Even if, as there is some reason to believe, the number of "dark" stars is very much greater than the number of bright ones (Lindemann's estimate is 4000),<sup>20</sup> the ratio referred to is still very large.

It is evident that unless this "residual" or "primordial" gas is exempt from mutual gravitation<sup>21</sup> it must give rise to a gravitational field very much greater than that of the whole sidereal universe, and should therefore be taken into account in existing theories of stellar dynamics. Although the dynamics of such a system would probably have to be modified to a considerable extent to take into account radiation pressure, we should still expect an enormously high density near its mass-centre, unless the whole be endowed with a small angular velocity, as is surmised to be the case with the Milky Way.

It follows from this brief discussion that we are either obliged to accept the existence of a widespread distribution of enormous quantities of interstellar gas of molecular density of the order  $10^5$  molecules per cm.<sup>3</sup> and take into account its influence in stellar dynamics, or conclude that the attenuation of light by scattering is very much less than is indicated by existing estimates of the absorption of stellar radiation in space.

LOUIS VESSOT KING.

McGill University, Montreal, June 30, 1915.

#### The Great Aurora of June 16, 1915.

In reply to Dr. Chree's note in NATURE for July 22 concerning the auroral display of June 16, I would say that the times (as indicated in my note in NATURE for July 15) were in Greenwich Mean Time. This, of course, begins at Greenwich Mean Noon. It did not occur to me that this might be misleading to the unastronomical reader. If one will subtract twelve hours from the times given by me, he will then have the dates for the morning of June 17 at Greenwich. Thus June 16d. 15h. 30m. G.M.T. will be June 17d. 3h. 30m. a.m., Greenwich Civil Time.

I will take the opportunity to quote here from the Los Angeles (Cal.) *Tribune* of June 18, 1915, a despatch from Chicago dated June 17:—

"Chicago telegraph operators were puzzled to-day when their wires failed at times to work. Soon, however, the explanation of the trouble came. It was not due to power stations or lack of current, but to the aurora borealis.

"The bewildering beauty of the northern lights lighted up all of Canada and the north-western part of the United States last night and caused electrical disturbances that put telegraph wires entirely out of commission in Idaho, Montana, and the Dakotas and along the Canadian Pacific railroad.

"The disturbances extended to Chicago to-day and to-night, and reports of trouble between Pittsburgh and New York, St. Louis and Kansas City, and many other cities over the country, were received. Operators here stated to-night that the disturbance was the worst they had known in five years.

"W. F. Weber, wire chief for the Western Union, reported service considerably demoralised.

"Our wires the whole length of the land were badly affected early to-day," he said. "They are affected still, though not to such a degree. The disturbance of the atmosphere causes fluctuation of the

<sup>20</sup> Lindemann, F. A., "Note on the Number of Dark Stars," *Monthly Notices*, lxxv. (1915).

<sup>21</sup> On this point note a remark by Eddington, *loc. cit.*, p. 258.

current on the wires, and interferes with rapid transmission of signals. We have been obliged to operate at a much lower speed than normal to-day.'

"The Postal Telegraph Company was similarly affected.

"It also was reported that train-dispatching on the Canadian Pacific railroad virtually ceased for several hours. Similar conditions prevailed on other northern transcontinental lines."

E. E. BARNARD.

Yerkes Observatory, Williams Bay, Wisconsin,

August 4.

#### Use of Celluloid in Periscope Mirrors.

I SHOULD be glad to know, in reference to the possibilities of diminishing the danger in using periscopes under fire: (1) whether experiments have been tried as to the effect of cementing a plate of celluloid to the back of the exposed mirror in preventing or reducing the splintering of the glass when struck by a bullet, and, if so, with what result; (2) whether there is any danger involved in the use of celluloid for this purpose?

EDWARD M. LANGLEY.

48 Waterloo Road, Bedford, August 17.

#### Foreign Philosophers.

ONE of the original objects of our Association for the Advancement of Science was to encourage the exchange of ideas with foreign philosophers, *vide* First Report of B.A. This year it will be a disappointment to many people in Manchester to have so few distinguished strangers. We now call them prisoners of war or alien enemies. But they still wish for scientific enlightenment.

Inquiries made in the prisoners' camp at Stobs reveal a small library carefully catalogued. They have some hundreds of English books, including some scientific books; also, in German, Schiller and Goethe. They ask particularly for *Naturwissenschaft in Deutsch, Chemie, Physik, Geologie, Botanik*, also *agriculture (Landwirthschaft)*, navigation, engineering, mathematics, mathematical astronomy for seamen, logarithms, *Electrotechnik*. There are repeated inquiries for a German book on spherical trigonometry, enough copies for the navigation class.

The requests we have the honour to transmit may be satisfied by sending books direct to Von Vorman, Librarian, Prisoner of War, Hut 18, Compound A, Stobs, near Hawick, Scotland. Inquiries as to books likely to be welcome in other camps may be addressed to the Emergency Committee, 169 St. Stephen's House, Westminster Bridge, S.W.

Some of the prisoners have already expressed a general willingness to remind their friends in Germany (with whom they are privileged to communicate) that the English prisoners in German camps are also asking for books.

Books sent by passenger train should be carriage paid, by parcels post they go free of charge.

August, 1915.

HUGH RICHARDSON.

#### French Magnanimity.

FRENCH history furnishes an interesting parallel to the magnanimity shown by Napoleon to the University of Pavia referred to in your issue of July 15. When Rudyard was engaged in building the second Eddystone Lighthouse a French privateer captured some of his workmen and carried them prisoners to France. Louis XIV., however, as soon as he heard of it, put the captain and crew in prison, released the workmen, loaded them with presents, and sent them home, saying that though he was at war with England, he was not at war with mankind.

GORDON D. KNOX.

11, Garrick Street, W.C., August 17.