as compared with the sharply selective, opacity of the upper reversing layer in the sun is negligible, is shown by the existence of the bright line flash spectrum.

It has been stated by various observers that the light-intensity at the centre of strong Fraunhofer lines is of the order one-tenth or one-twentieth that of the neighbouring continuous background. This fact is opposed to the conclusion that the temperature of the region where the lines are produced is as high as 0·85 that of the photosphere. For whether the dark lines are caused by selective absorption or by a combination of absorption and selective scattering, examination of the equations of transfer of radiant energy through a gas indicates that the intensity at the centre of a line should not be less than that of black-body radiation of the same frequency, and corresponding to a temperature equal to that of the uppermost region in the stellar atmosphere effective in producing the line.

In this connexion, conversation with Prof. H. N. Russell has resulted in working out the following illustrative argument. About a given small region in the reversing layer place (in imagination) a complete opaque enclosing surface, maintained at the temperature which normally exists in the given region. Then the radiation emergent through a small aperture in the upper side of the enclosing surface will be black-body radiation corresponding to that temperature. For a given wave-length concerned in a Fraunhofer line, the opacity is large, and this radiation will come partly from the gas, and partly from the back of the enclosure. Now suppose the enclosure removed. The rôle formerly played by the back of the enclosure is then played by some deeper and hotter layer of the atmosphere. (For wave-lengths not concerned in Fraunhofer lines the said deeper layer is the photosphere.) Thus the total flux of energy through the gas in the given region is no smaller than before; and in consequence the rate of scattering will be at least as great. Since the temperature is by hypothesis unchanged, the rate of radiation of the gas in the region is unaltered by the removal of the enclosure. Therefore the whole brightness for the given wave-length will increase if it changes at all.

In the case of the sun, taking the effective temperature of the photosphere as 6000°, and that of the reversing layer as 0·85 of this, or 5100°, the ratio of the intensity at the centre of the dark line to the intensity of the neighbouring continuous background, should be for the D lines about 0·50 (assuming Planck's formula). To reduce the calculated ratio to the observed value, say, 0·10, the effective temperature of the reversing layer for these lines required by the Planck formula is about 4000°.

A good correlation has been found by Dr. St. John (Mt. Wilson Contributions, No. 88, 1914) between the intensities of Fraunhofer lines in the solar spectrum and the heights above the photosphere to which the corresponding chemical elements extend, as given by observations of the flash spectrum at eclipse. The less intense Fraunhofer lines are produced altogether in the lower regions, where the temperatures may be supposed nearer that of the photosphere. It is probable that these data indicate a greater temperature-gradient in the solar atmosphere than is predicted by the conventional "grey body" mathematical treatments.

It is obvious that further physical, mathematical, and observational studies of the problem of estimating temperatures in stellar reversing layers are to be desired. In particular, quantitative data are required concerning the variation from centre to limb of the sun of the intensity in Fraunhofer lines and relating such intensities to effective heights. There would seem to be a possibility of determining the temperature-gradient from such observations. The evidence outlined above indicates (1) that lower average temperatures should be adopted, say of the order 0·7 rather than 0·85 of the photospheric temperature; and (2) that the equilibrium may depart correspondingly further from the isothermal condition.

JOHN Q. STEWART.

Princeton University Observatory,
February 8.

Auto-obituaries.

IT sometimes happens that an obituary notice in NATURE arouses much criticism, and it is seldom that one does not hear that some one else "could have done it much better." The point arose at one of the dinners which George Murray Smith used to give to the contributors to the "Dictionary of National Biography." I remember Dr. Creighton, Bishop of London, remarking, in a speech, that as we were all more or less entitled to a place in that Walhalla, the question could scarcely help arising in our minds as we conversed with our neighbours at table: "Shall I do *you*, or will you do *me*?" Why not invite all the leading scientific workers whose deaths you are looking forward to recording in NATURE to write their own obituary notices? Such auto-obituaries would be most useful to your post-mortem panegyrists.

F.R.S.

[Obviously, such autobiographies as are suggested by our correspondent would be purely records of what the writers considered to be the chief events or achievements of their careers. Obituary notices in NATURE are, however, usually personal appreciations of the scientific significances of the lives and work of departed friends, and such independent testimonies, even when not effusively favourable, are of far greater interest than any auto-surveys ever possibly could be.—EDITOR, NATURE.]

The Phosphorescence of Fused Transparent Silica.

THE phenomenon mentioned by Chapman and Davies in NATURE of March 1, p. 309, is certainly a most striking accompaniment of the discharge in tubes of fused silica, but we doubt the correctness of their interpretation.

We have recently been using such tubes for discharges in the halogens, hydrogen and the hydrogen halides, and in one case, on warming the tube after three days, we were surprised to find the phosphorescence burst out in broad daylight. One of us, however, had noticed some years ago the phosphorescence of fused silica which had been exposed to the light from an aluminium spark, and had attributed it to the fact that silica begins to absorb strongly in the neighbourhood of the strong aluminium lines at 186 and 176 $\mu\mu$.

The colour of the phosphorescence differs, under otherwise identical conditions, with the specimen of silica, and is probably due to minute traces of impurity; we have had green and pale violet from different parts of a tube made from two tubes joined together, though the discharge was identical in both parts.

In the case of hydrogen, the radiation absorbed is probably the Lyman series; the radiation for fluorine and chlorine has been photographed by Millikan; a strong line we get at 206 $\mu\mu$ in the case of iodine may turn out to be the first of a series ending at 155 $\mu\mu$, corresponding to the ionisation potential of that gas.

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