electron, then a simple explanation can be given, for since there are two 2_1 and two 2_2 electrons in the carbon atom, two of the bonds will differ from the other two, that is, two of the pairs of electrons will be differently bound from the other two. Two ionisation potentials would therefore be expected having approximately equal probabilities of excitation. This assumes that the ionisation potential of either of the two electrons forming a bond is the same. That two of the bonds in methane differ from the other two is in agreement with Mrs. Lonsdale's view that the carbon atom has two different kinds of valencies (*Phil. Mag.*, **6**, p. 433; 1928), and is also supported to some extent by the observation of Cabannes and Gauzit (*Jour. de Phys.*, **6**, p. 182; 1925), that methane has a small depolarisation factor, an indication of small optical anisotropy. Experimental evidence also tends to show that models of the methane molecule having either a C^{4-} or a C^{4+} central ion are incorrect (cf. T. H. Havelock, *Phil. Mag.*, **3**, p. 444; 1927; **4**, p. 721; 1927).

G. W. BRINDLEY.

Physical Laboratories,
University of Leeds,
April 26.

The Constitution of Oxygen.

DR. F. W. ASTON has remarked (NATURE, **123**, 488; Mar. 30, 1929) that he finds no positive ray evidence for the existence of isotopes of oxygen, and he states that if 0^{18} exists, as concluded by Giauque and Johnston (NATURE, **123**, 318; Mar. 2, 1929), it must be in a proportion less than 1/1000 of 0^{16}.

Giauque and Johnston based their result on data published by Dr. Dieke and myself (*Proc. Nat. Acad. Sci.*, **13**, 670; 1927). Further evidence bearing on the question has now been found, confirming the existence of 0^{18}, and also the limiting proportion set by Aston. From spectrograms made with low solar altitude it has been possible to augment the A' band of oxygen from 26 lines, as formerly described, to 73 lines. About one-half of these belong to the alternate system of doublets which are to be expected from the unsymmetrical molecule 0^{16}–0^{18}, while the rest of the new lines are extensions of the previously recognised system of doubtlets. The observed positions of the lines of this band agree with those calculated for the isotopic molecule, and the new data thus decisively confirm the existence of 0^{18}.

Intensities of the isotopic band lines have been compared with those of homologous lines in the A band by so choosing the lengths of air-path as to make the two bands appear alike when registered with the same spectrograph. From the ratio of the air-paths it was found that the A band is 1250 times as intense as the A' band, and, approximately at least, this represents the relative abundance of the molecules 0^{16}–0^{16} and 0^{16}–0^{18}. More complete discussion will be found in a forthcoming paper in the *Proceedings of the National Academy of Sciences*.

HAROLD D. BABCOCK.

Mount Wilson Observatory,
Pasadena, California,
April 15.

Selective Absorption by Excited Mercury Vapour.

OUR attention has been directed to a paper by M. M. Ponte on the selective absorption by excited mercury vapour (*Comptes rendus*, **187**, 37-39, July 2, 1928) giving results of photometric measurements on the prominent lines in the arc spectrum of mercury. M. Ponte refers to a paper by us on the same subject (*Proc. Roy. Soc.*, A, **100**, p. 149; 1921), but does not notice a paper by Turner and Compton (*Phys. Rev.*, **25**, 606-612; 1925). He finds that the absorption diminishes as the current term number of the line in a series exhibiting absorption increases; a similar result has been recorded by Turner and Compton (loc. cit.).

In the latter part of his paper, M. Ponte records his observation of the reversal of the green line and six of its satellites and of 4358, but not of the two yellow lines. In this connexion we have to point out that in a paper published by us in 1924 (*Proc. Roy. Soc.*, A, **105**, 520-531), not referred to M. Ponte, we have described, among others, experiments proving the reversal of the green line and all its satellites except one, namely, $-0{\cdot}237$, of the line 4358 and four of its satellites, of the two yellow lines, and two of the satellites of 5769, namely, $+0{\cdot}044$ and $-0{\cdot}050$. The device of using the broadened lines from a high pressure source as a background for the formation of the reversal lines produced by an absorbing column at low pressure suggested by M. Ponte has been mentioned by us in the same paper. M. Ponte's method of exciting the absorbing column by maintained high frequency oscillations is of special interest.

E. P. METCALFE.
B. VENKATESACHAR.

Central College,
University of Mysore,
Bangalore, India, April 3.

Raman Effect in Atomic Hydrogen.

IN the paper on the dispersion of hydrogen-like atoms published in the *Proc. Nat. Acad. of Sci.*, **14**, 253 (1928), I have obtained a solution of the Schrödinger wave equation, for a hydrogen atom in the field of radiation of frequency ν, of the form

$$\psi = e^{2\pi i E t/h}[\psi_0 + e^{2\pi i\nu t}u_1 - e^{-2\pi i\nu t}u_2],$$

where ψ_0 is the solution of the unperturbed equation, while u_1 and u_2 are small quantities which are functions of co-ordinates only.

The Raman effect for atomic hydrogen comes out of this solution naturally. If one calculates the matrix elements corresponding to components of the electric dipole moment, one obtains terms containing factors $\exp 2\pi i(\nu - \nu_1)t$, $\exp 2\pi i(\nu + \nu_1)t$, and $\exp 2\pi i\nu_1 t$ respectively, where ν_1 is the frequency of absorption lines. In addition to the ordinary transitions, the transitions with a change of azimuthal quantum number by ± 2 are now permitted. Details of the investigation will be published elsewhere.

BORIS PODOLSKY,
(National Research Fellow).

University of California,
Berkeley, California,
April 15

Ozone Absorption during Long Arctic Night.

A LETTER from Prof. R. W. Wood on this problem (NATURE, April 27, p. 644) calls for some comment. Prof. Wood's contention that my observations of ozone absorption in December last (cf. NATURE, Feb. 9, p. 207) are not decisive because the atmosphere above my station was sunlit at noon, overlooks the important fact that *this sunlight had all been filtered through the atmosphere, and at grazing incidence, such as to have its activating constituents effectively removed.* On account of the crude equipment the results are, however, provisional in nature, and this and allied problems will therefore be pursued next winter with an improved telescope.

S. ROSSELAND.

University Observatory,
Oslo, April 29.