the hyperbolic susceptibility-temperature relationship for gaseous oxygen (Také Soné, *loc. cit.*).

(6) If the diamagnetism of hydrogen is attributed to thermal oscillations or rotations, we might expect that χ_H for the gas at 16° C. would be greater than χ_H for liquid hydrogen at −253° C. Precisely the reverse holds, according to the above data, and there is certainly no indication that at low temperature χ_H is tending to change sign.

A variation of χ_H from -19.8×10^{-7} to -27×10^{-7} for a temperature interval of 16° C. to −253° C., together with the fact that χ_H in different types of organic compounds is constant and equal to -30.5×10^{-7}, points to the conclusion that thermal oscillations and rotations have little to do with the *origin* of diamagnetism in molecular hydrogen, and that the Bohr hydrogen molecule will not account for it.

The present writer's view is that the free hydrogen atom is probably paramagnetic, but the structure of the hydrogen molecule must be such that by compensation it is, as a whole, diamagnetic. A model of the hydrogen molecule which satisfies these conditions was suggested in NATURE of May 13, 1920. In this model the individuality of the hydrogen atom is preserved, and this may have some bearing on the origin of the primary and secondary hydrogen spectra.

A. E. OXLEY.

The British Cotton Industry Research
　Association, 108 Deansgate, Man-
　chester, June 28.

University Stipends and Pensions.

ALL university teachers will thank you for the leading article in NATURE of June 17 pointing out the injustice done to them and to university education by the exclusion of such teachers from the provisions of the School Teachers (Superannuation) Act, 1918. On one point, however, the article is misleading. It is stated that "what complicates matters is the fact that there exists a contributory pension scheme in the universities—the federated superannuation scheme—which is thought by some to be superior to the Teachers Act in certain respects." It should be made quite clear, however, that the governing bodies of university colleges are at liberty to adopt the federated scheme or not, and that the governing bodies of some colleges have refused to adopt it, with the result that the staffs of these colleges have no prospect of any pensions whatever. The position in the University of London is, therefore, even more anomalous than was suggested, since some schools come within the provisions of the Act, some have contributory pension schemes, and some have none. The Northampton Polytechnic Institute and the Imperial College of Science and Technology have each an engineering department the courses in which enable their students to take the B.Sc. degree of London University as internal students of the University. The lecturers of each sit side by side on the Faculty of Engineering and on the various Boards of Studies of the University. The first-named institution is included in the Teachers Act, but the last-named is excluded. Lecturers at the former retire at the age of sixty with a non-contributory Government pension, whilst their *confrères* at the Imperial College may work as long as they are able with no prospect of any pension whatever.　　　G. W. O. H.

THERE is nothing in "G. W. O. H.'s" letter to support his statement that the article is misleading.

It is true that no university or university college is compelled to join the federated scheme, but it is equally true that such a scheme exists, and that most universities and university colleges have adopted it. The additional particulars which "G. W. O. H." gives were known to us, but obviously in a short article every variety of illustration could not be included.— ED. NATURE.

The Separation of the Isotopes of Chlorine.

IN agreement with Prof. Soddy, I find myself unable to understand how it is possible to separate isotopes by the method suggested by Mr. D. L. Chapman in NATURE of June 17. Nevertheless, a certain paradox has been brought to light in connection with Nernst's theorem the solution of which is not without interest.

The paradox to which I refer is this : Consider the equilibrium in the gaseous reaction $Cl_2 + Cl'_2 \rightleftharpoons 2ClCl'$. If the gases behave as perfect gases, and if Cl and Cl' are identical or differ only very slightly, then it is easy to show by probability considerations that the equilibrium must be given by

$$\frac{[ClCl']^2}{[Cl_2][Cl'_2]} = K = 4.$$

From this it follows that to convert a gram-molecule of Cl_2 *plus* a gram-molecule of Cl'_2 into two gram-molecules of $ClCl'$ at the same temperature and pressure, α will require an amount of available energy equal to $-RT \log 4$.

Now if the chemical and physical properties of the isotopes are truly identical, then from this and the necessary equality of the vapour pressures it is readily shown that to convert a gram-molecule of solid Cl_2 *plus* a gram-molecule of solid Cl'_2 into two gram-molecules of solid $ClCl'$ also requires $-RT \log 4$ of available energy. Therefore the difference in the entropies of the two sets of solids is $R \log 4$, which, being independent of the temperature, must exist at the absolute zero.

It is, however, unjustifiable to say that this contradicts Nernst's theorem, and to deduce from this theorem that K for the gaseous reaction must be 1 in order to make the change in the entropy zero. For if there is a true identity, then this implies that there are no forces to guide the atoms into any particular configuration, so that even down to the zero of temperature no true reaction is possible, and what occurs is really of the nature of mixing. That a difference of entropy occurs on mixing, even at the zero, is necessary, and in no way contradicts Nernst's theorem ; in fact, the case of mixtures is explicitly excluded by Nernst.

If, on the other hand, there is a real, but small, difference in the two isotopes, then, as before, K will very nearly equal 4. Now, in order to obtain the difference in the entropies between the solids near the zero of temperature, let us carry out the cycle described by Mr. Chapman, but in the neighbourhood of the zero. Then, in spite of the fact that the isotopes differ very little, it is impossible to say that the vapour pressures remain equal. Thus it is impossible, so long as there is any difference at all between the isotopes, to argue that because $K = 4$ for the gaseous reaction there must be a finite change in entropy at the absolute zero.

ANGUS F. CORE.

The University, Manchester, July 4.