The Hydrogen Molecule.

IN his very interesting letter on this subject to NATURE of Jan. 28, Prof. Birge has decided that the first of the two alternatives which I proposed for the structure of the spectrum of H_2 is correct. I should have been very much pleased to obtain the support of so eminent and experienced a band spectroscopist for either view; but at the present time there is no material divergence between us. The last of the two or perhaps three papers [1] which Prof. Birge traverses was written nearly a year ago. At that time it was obvious that there was a misfit somewhere, and I indicated two alternative positions for it. Since then much information about the extreme ultra-violet, as well as the visible spectrum, has come to light. There are also the results of the calculated structure of the hydrogen molecule which have been obtained by the new quantum mechanics. It now seems fairly certain that the suspected coincidence of my 2^3P level with Dieke and Hopfield's C level is an accident. The case for the coincidence of my 2^1S level with their B level is much more convincing.

If this coincidence is correct the following fact is very curious. On Werner's plates taken in the visible, which he has kindly allowed me to inspect, I find the violet bands $2^1S - 3^1P$ and $2^1S - 4^1P$ strongly developed. On plates taken in the far ultra-violet under the same discharge conditions Werner finds his own bands, $A - C$ ($1^1S - C$), strongly developed, but if the Lyman bands, $A - B$ ($1^1S - B$), are present, they are very weak. The presence of the violet bands shows that the 2^1S states are formed; the weakness of the Lyman bands shows that they pass with difficulty into the 1^1S state, which is the only known deeper state. It looks as though they must get rid of their excitation energy by dissociating the hydrogen molecules with which they collide. The Lyman bands are present in the absorption spectrum of H_2, but they can only be excited efficiently in emission in presence of a large excess of argon. This will greatly reduce the opportunity of the excited hydrogen molecules to collide with other hydrogen molecules.

As regards the method by which I calculated B_0 (the band constant which is inversely proportional to the moment of inertia) for the 2^1S and 3^1P states, I used it because there was no other method available. I expressly stated that it was inaccurate in the data to which it had to be applied, and that the value obtained for the 2^1S state was likely to be too high. I now think that this error is due to some of the weaker lines being probably the wrong lines. Accepting Prof. Birge's value of about 28 for $2B_0$ for the 2^1S state, the second differences of the strong ${}_0A_0$ band in which the lines are probably trustworthy, show that the value 41 got by the same method for 3^1P was about right.

It is, at any rate, a cause for great satisfaction that there exists at the present time a complete harmony between the interpretation of the spectroscopic data for the molecule H_2 on one hand and the results of the theory of its structure according to the new quantum mechanics, as well as the theory of the specific heat of hydrogen, on the other. However, the last chapter of this story is not yet written. There are even now many important lines in the secondary hydrogen spectrum which are not understood and there may be room for some surprises still.

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[1] *Proc. Roy. Soc.*, A, vol. 111, p. 714; vol. 113, p. 368 (1926); vol. 115, p. 528 (1927).

The Dominant Species of Ostrea.

IN reviewing the characters of the dominant species of oysters, Ostrea, of which something is known of the life-history as well as the shell-characters, two distinct types are recognisable.

Type I. consists at present of

O. edulis, Linn., the European oyster (see Hoek [1] and Dean [2]).
O. lurida, Carpenter, the British Columbian oyster (see Stafford [3]).
O. Angasi, Sowerby, the south-west Australian oyster (see Roughley [4]).

In this type the shell is sub-circular; the egg is large; the adult larviparous; the individual is hermaphrodite; spawning occurs at medium temperatures, round about 15° C.; and the species flourish in temperate regions.

Type II. consists at present of

O. virginica (≡*elongata*), Gmelin, the American-Canadian oyster (see Stafford [3]).
O. angulata, Lamarck, the Portuguese oyster (see Dean [2]).
O. cucullata, Born, of world-wide distribution in sub-tropical and tropical parts (see Dean [5] and Roughley [6]).

In this type the shell is elongated in an antero-dorsal and postero-ventral direction; the egg is small; the adult non-larviparous; the individual of one sex only; spawning occurs at moderately high temperatures (round about 20° C.); and the species flourish in sub-tropical or tropical regions.

Although the species noted above are among the most abundant and most successful of the genus, a large number of other supposed species have been described (Sowerby [7])—from shell characters—at various times. Shell-characters are, however, now known to exhibit great range of variation within the species in the genus Ostrea, and it may be anticipated that in the—probably distant—future many supposed species will be found to be mere varieties. At present we are therefore confronted with a supposed large genus containing at least two well-defined groups of species amongst the best known and the most successful forms in the genus. These successful forms are, however, of such world-wide distribution that it is difficult for one individual to summarise into an accurate technical description the assemblage of characters occurring in the two types noted above.

It seems clear, nevertheless, that there is justification for recognising two groups of species, whether the groups be regarded as differing generically or only sub-generically. Type I. is clearly Ostrea, of generic, or type sub-generic value. while type II. may be regarded as Ostrea, sub-genus Gryphæa, or a separate genus, for which the name Gryphæa may be suggested, or a new generic name may be preferable, and Dioeciostrea is a suitable one.

In a question of this kind international co-operation would be highly desirable in order to avoid over-weighting of the literature with names. On the other hand, a decision must be made by someone, and if sufficient care be devoted to the matter it should be possible to avoid complications in the literature and at the same time give a better expression to the relationships of known forms than exists at present.

[1] Hoek, P. P. C., *Tijd. Nederl. Dierk. Ver.*, Supp. Deel i., 1883–4.
[2] Dean, B., *Bull. U.S.F.C.*, **10**; 1890 (1892).
[3] Stafford, J., "The Canadian Oyster," 1913, Ottawa.
[4] Roughley, T. C., *Australian Museum Magazine*, **2**, 1925.
[5] Dean, B., *Bull. U.S.F.C.*, **22**; 1902 (1904).
[6] Roughley, T. C., *Proc. Linn. Soc. N.S.W.*, **2**, 4; 1926.
[7] Sowerby, G. B., in Reeve's *Conchologia Iconica*, Part 288, 1871.