BH_3 together is a (double) bond, as in ethylene or oxygen. The difference in chemical behavior of O_2, C_2H_4 and B_2H_6 must then be ascribed to the fact that in these three cases the positive charge within an octet consists of a single kernel in O_2, a carbon kernel and two protons in C_2H_4 and a boron kernel and three protons in B_2H_6.

The next step would be to locate the protons within the octet in some symmetrical fashion, but such a detailed picture is at present not necessary.

It is evident that the present view considers the completion of a stable shell (an octet) as the primary cause of chemical combination and the valency of an individual atom as a rather secondary phenomenon.

In the first instance, it is only necessary to consider the radicals BH_3, BH_2, etc., equivalent to CH_2, CH, etc. In both cases their positive charges are thought to be located inside of an octet of electrons. Further details of this theory will be published in another place.

Geo. Glockler
School of Chemistry,
University of Minnesota

ON THE SPECTRUM OF DOUBLY IONIZED MAGNESIUM

An investigation of the condensed spark discharge in vacuum between electrodes of pure metallic magnesium has revealed the levels of the most stable three configurations of the doubly ionized atom, isoelectronic with neon.

The transition frequencies and term separations were predicted to a high degree of accuracy by the X-ray doublet laws and a consideration of the first order screening numbers; the values were extrapolated from the arc spectrum of neon, which is well known from Paschen's famous analysis, and the first spark spectrum of sodium, recently analyzed independently by four different investigators (Bowen, *Phys. Rev.*, 31, 967, 1928; Frisch, *Zs. f. Phys.*, 49, 52, 1928; Laporte, *Nature*, 121, 941, 1928; Majamdar, *Ind. Jour. Phys.*, 2, 345, 1928).

The notation of the s – and p – terms follows that used by Paschen in neon. Several possible values have to be listed for the p – terms with inner quantum numbers 3 and 0; we hope that values for these terms may be selected unambiguously later by combinations with higher terms.

The key to the analysis was found in the resonance lines, $\lambda = 231.71$, $\nu = 431570$, int. = 2, and $\lambda = 234.25$, $\nu = 426890$, int. = 1, the stronger of which was recorded by Millikan and Bowen in their first report on extreme ultra-violet spectra (*Phys. Rev.*, 23, 1, 1924). All the other lines are new. All the expected transitions between the terms listed have been found, with the exception of $s_2 - p_{10}$, $\lambda_{calc} = 2881.2$, which lay outside the range investigated, and $s_4 - p_7$ and $s_4 - p_2$, whose intensity was expected to be low.

The terms of Mg III have the following relative values:

configuration	name	j-value	term value
$2p^6$	^1S	0	–425680
$2p^53s$	s_5	2	0
	s_4	1	1216
	s_3	0	2193
	s_2	1	5881
$2p^53p$	p_{10}	1	40589
	p_9	3	47906
			or 48480
			or 48625
	p_8	2	48888
	p_7	1	49822
	p_6	2	51935
	p_5	1	51980
	p_4	2	52270
	p_3	0	52328
			or 52780
	p_2	1	54608
	p_1	0	57290
			or 58432

The ionization potentials of magnesium are as follows:

Mg I	$3s^2$	$^1S_0$	to	Mg II	$3s$	$^2S_1$,	7.61	volts
Mg II	$2p^63s$	$^2S_1$	to	Mg III	$2p^6$	$^1S_0$,	14.97	volts
Mg III	$2p^6$	$^1S_0$	to	Mg IV	$2p^5$	$^2p_2$,	80 ± 2	volts

Most interesting in the neon-like isoelectronic sequences is the trend of the relative separations in the $2p^53s$ "triplet" $s_5(^3P_2)$, $s_4(^3P_1)$, $s_3(^3P_0)$. The relative separations $^3P_1 - {}^3P_2 : {}^3P_0 - {}^3P_2$ are as follows:

"normal"	.667
Ne I	.537
Na II	.564
Mg III	.554

The downward curvature of this ratio might be taken as evidence against Hund's correlation of inverted terms to series limits. (See Mack, Laporte, and Lang, *Phys. Rev.*, 31, 748, 1928, esp. p. 763 for the analogous case of the d^9s triplets, and Shenstone, *Nature*, 121, 619, 1928, for a more general discussion of series limit correlation of inverted terms.)

A more complete report on the spectrum of Mg III will be published after a search for higher terms has been completed.

J. E. Mack
National Research Fellow
R. A. Sawyer
Department of Physics,
University of Michigan