the groups of  $\sigma$  or  $\pi$  components,  $J, J + \Delta J$ the inner quantum numbers, and  $g_1$ ,  $g_2$  the magnetic factors, their formulae may be written (after a little algebra)

$$\Delta J = -1 \ 2B_{\sigma} = (J+1)g_1 - (J-1)g_2$$
  

$$B\pi = 0$$
  

$$\Delta J = 0 \ 2B_{\sigma} = g_1 + g_2$$
  

$$(4/3)B\pi = \pm (g_1 - g_2) \frac{J(J+1)}{J + \frac{1}{2}}F.$$

When J is integral, F=1; when J is halfintegral (even multiplicity)  $J = 1 - (1)/16J^2$  $(J+1)^2$ . This factor lies between 0.995 and 1, and may be neglected, except when  $J = \frac{1}{2}$ .

Substituting Landé's value, g=3/2+[S(S+1)-L(L+1)]/2J(J+1) and using J, L to denote always the greater of the two values involved in a transition, we find easily

 $B_{\sigma}$  $B_{\pi}$ Ordinary multiplets  $\frac{3}{2} - L/2J$ 0 Diagonal lines

$$\begin{array}{c|c} & B_{\sigma} & B_{\pi} \\ \hline First \ satellites & \frac{1}{2}(g_1+g_2) \ 3L/(2J+1)^* \\ Second \ satellites & \frac{3}{2}+L/2J & 0 \\ Symmetrical \ multiplets \\ Diagonal \ lines & g & 0 \\ Satellites & \frac{3}{2} & 0 \\ * When \ J=\frac{1}{2}, B_{\sigma}=(4/3)L \end{array}$$

These formulae are remarkably simple. It is noteworthy that they do not involve S, except in the case of  $B_{\sigma}$  when  $\Delta J = 0$ . It is only in this case that unresolved patterns can give any information about the multiplicity.

Even for resolved patterns,  $B_{\sigma}$  has a definite physical meaning; it is the weighted mean magnetic shift for all the radiation of a given state of polarization. It is noteworthy that these quantities come much nearer to satisfying Runge's rule of "simple denominators" than do the shifts for individual components. HENRY NORRIS RUSSELL

of the center of the HBr vibration-rotation

band is, according to Imes (Astrophys. J. 50, 251 (1919)), 2559. The center of the vibra-

tion-rotation band of HI has yet to be de-

termined in absorption, though Czerny (Zeits.

f. Physik 44, 235 (1927)) concluded that his

measurements indicated it around  $4.4\mu$  (about

E. O. SALANT

M. W. Zemansky

A. SANDOW

Princeton University, October 24, 1930.

2270 wave numbers).

Washington Square College,

New York University.

October 25, 1930.

## Raman Effect of HBr and HI

With R. W. Wood's method (Phil. Mag. 7, 744 (1929)), a long mercury arc and a long tube containing gas at atmospheric pressure, we have measured modified lines scattered by HBr and HI, using a Hilger constant deviation spectrograph and iron arc standards. HBr lines were scattered from 4047 and 4358, HI from 4358 only, as all radiation of shorter wave-length had to be filtered out to decrease photochemical decomposition.

The shifts of the Raman lines, corresponding to (0, 1) vibrational transitions, are, according to these measurements: HBr 2556, HI 2233 vacuum wave-numbers. The value

## Absorption and Collision Broadening of Resonance Radiation

In a recent paper in the Physical Review,<sup>1</sup> that the two expressions are mathematically identical. an expression was given for the optical absorption coefficient of a gas under conditions in which Doppler broadening of the absorp-Kaiser Wilhelm Institut tion line was superimposed on collision broadfür Physikalische Chemie, ening. The object of this letter is to mention Berlin-Dahlem, October 20, 1930. that a similar expression was given by F.

<sup>1</sup> Zemansky, Phys. Rev. 36, 219 (1930). <sup>2</sup> Reiche, Verh. d. D. Phys. Ges. 15, 3 (1913).

## On the Incomplete Polarization of the Mercury Resonance Radiation

It has been shown by Ellett and McNair (Phys. Review 31, 180, 1928), that the incomplete polarization (80%) of the mercury resonance radiation in zero magnetic field is

Reiche in a paper<sup>2</sup> with which I was not ac-

quainted at the time. It can be readily shown

due to the unpolarized radiations of the two outer components of the hyperfine structure of the 2537A mercury resonance line. According to these authors, the unpolarized part

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