1927) and Sommerfeld ("Atombau . . . Wellenn. Erg.", p. 251). Supposing that an electron could pass from an orbit K, L . . . to an optical orbit, we approached the problem using Schrödinger's functions ψ relative to the H, assuming that the exciting frequency is much larger than the frequency of the limits of absorption. In these conditions, we have obtained by calculations that the intensity of the Raman lines is different according as the initial state is K or L or M . . . level and the final state is the optical level $1s$, and is also different if the final state instead of $1s$ becomes the state $2p$. We have found that, indicating by E_e the kinetic energy of the electron emitted for the Compton effect in one particular direction of observation, and with one particular exciting frequency, the intensity of the Raman line for an element of atomic number Z observed along the same direction is proportional to the quantity

$$Z^{-3}\left(1+\frac{E_e}{|E_\mu|}\right)^{-4}$$

where $|E_\mu|$ is the energy of the K level if the jump is $K \rightarrow 1s$. As the intensity of the undisplaced line is proportional to

$$\left(1+\frac{E_e}{4|E_\mu|}\right)^{-4}$$

we see that the relation of the intensity of the Raman line to the undisplaced line is practically inversely proportional to the cube of the atomic number. More complex expressions have been obtained for the jumps $L \rightarrow 1s$, $M \rightarrow 1s$. If the final optical orbit is a level $2p$, then the intensity is proportional to Z^{-5}.

From our theoretical investigations we conclude that to observe this effect it is necessary (1) to use substances presenting semi-optical lines, (2) to use substances of low atomic number, (3) to use exciting wave-lengths, directions of observations, and substances for which the relation $\frac{E_e}{|E_\mu|}$ is very high.

Details of calculations will be published elsewhere.

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Existence of two Limits of Predissociation in the Nitrogen Peroxide Molecule and the Heat of Dissociation of Oxygen.

The absorption spectrum of nitrogen peroxide vapour is composed of two regions: the first from the red to about 2900 A., the second from 2596 A. to about 2200 A. These two regions correspond to two different electronic activations of the molecule.

The first region is made up of a large number of bands and fine lines having a very complicated structure, which we are studying now with L. Harris. From the visible up to about 3700 A. the bands are very fine with quite definite rotation lines; there are two or three fundamental vibration frequencies. But between 3800 A. and 3700 A. the bands become broad and diffuse, the fine structure disappears. This corresponds to the first limit of predissociation.

In the second region we have obtained with L. Harris between 2596 A. and 2459 A. a series of bands with a fine structure corresponding to a very clear double rotation spectrum; at $\lambda = 2459$ A., the bands become abruptly diffuse and broad and up to 2200 A. there are nine such bands. This is the second predissociation limit.

The physical interpretation of these two predissociation limits is that they correspond to the two limits of dissociation of the nitrogen peroxide molecule into nitric oxide and a *normal* or an *activated* oxygen atom.

The corresponding energies are:

(1) $NO_2 \rightarrow NO + 0 - 77,000$ cal.(3700 A.)
(2) $NO_2 \rightarrow NO + 0^* - 116,000$ cal.(2459 A.)

The first is in exact agreement with the results obtained by Norrish (*Chem. Soc.*, June 1929), who obtained a photochemical dissociation of NO_2 into NO and O_2 by light of $\lambda = 3650$ A., and no action by $\lambda = 4300$ A., the light of $\lambda = 4050$ A. giving a very slight reaction.

From these results, the heat of dissociation of the oxygen molecule can be calculated:

$$O_2 \rightarrow 0 + 0 - 128,000 \text{ cal.}(5{\cdot}5 \text{ volts});$$

and the activation of oxygen atoms:

$$0 \rightarrow 0^* - 39,000 \text{ cal.}(1{\cdot}7 \text{ volts} = 13,700 \text{ cm.}^{-1}).$$

The dissociation energy of the oxygen molecule was calculated first by Birge and Sponer as 163,000 cal. (7·1 volts), then corrected by Birge (*Phys. Rev.*, **34**, 1062; Oct. 1, 1929), Bristol meeting of Faraday Soc. (Sept. 24, 1929) to 5·6 – 6·5 volts; by Kassel (*Phys. Rev.*, **34**, 817; 1929) to 5·0 – 5·5 volts, and by Mecke (*Naturwissenschaften*, Dec. 20, 1929) to 5·6 volts.

The active oxygen obtained from the second predissociation limit is probably in the metastable ^1D state.

The value $^3P_2 - {}^1D$ is not known for oxygen; R. Frerichs (*Phys. Rev.*, **34**, 1239; Nov. 1, 1929) gives a probable value of 15,500 cm.$^{-1}$; McLennan (Nature, Dec. 7, 1929, p. 874) has calculated by analogy with selenium and tellurium spectra a value of 10,587 cm.$^{-1}$. Our value is therefore the mean of the two.

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Tides of the Upper Atmosphere and the Heights of Meteors.

In Nature of Dec. 14, 1929 (vol. 124, p. 913), the result of an examination of some data giving the heights at which the meteors disappear has been published. There seemed to be a variation of these heights with the lunar hour-angle. By kind information from Dr. G. M. B. Dobson my attention was directed to a great number of observations of the heights of meteors given by Mr. W. F. Denning in *Monthly Notices of the Roy. Astron. Soc.*, March 1912 and January 1916. These observations (556) were divided into 6 groups and treated in the same manner as the former. Using the same designations as in the former letter, the following values were found for the mean height at which the meteors disappear:

Flood-tide .	46·9 ± 1·8 miles
+ 0 .	47·0 ± 1·1 ,,
– 0 .	49·2 ± 1·9 ,,
Ebb-tide .	49·1 ± 0·8 ,,

The mean error is derived from the 6 group-means. Examining in the same manner the heights at which the meteors appear, the following values for the mean height are found:

Flood-tide .	70·1 ± 2·2 miles
+ 0 .	67·5 ± 1·9 ,,
– 0 .	70·8 ± 2·6 ,,
Ebb-tide .	71·6 ± 1·0 ,,

From the result of the former letter it would be expected that the mean height for flood-tide (and + 0) should be greater than that for (– 0 and) ebb-tide, both for the heights referring to the disappearance of the meteors and for the heights referring to the appearance. This is in no way the case; on the con-