the excess of energy is utilised in imparting kinetic energy to the ejected electron. In order to explain the secondary absorption it is assumed that not only can a quantum of radiation be absorbed by a single electron in an atom, but also that the same quantum can be absorbed successively by two or more electrons occupying different energy levels in the atom. Those quanta which can thus successively remove two or more electrons (say one from the K and the other from the M level) out of the atom, will be selectively absorbed and will therefore appear as absorption edges on the shorter wave-length side of the primary K limit.

The process of first absorption of the incident quantum by the atom mainly determines the position of the secondary edge and may take place in a number of ways. Thus the incident quanta may knock an electron from the valency or from the $M_2(M_{II}, M_{III})$ or from the M_1 shell, either to some higher optical level or to infinity (zero energy), or may raise the electron from M_1 to M_2 level, if there is any space for it, and thus give rise to a number of possibilities for the appearance of the secondary K edges. From the interpolated values of higher levels of the atom from X-ray and from optical data, a rough calculation is made of the shift of these edges, and the following table shows the observed (Nuttall) and the values calculated according to the point of view taken in this paper for chlorine. Here the combinations are of the types, ν_K, $\nu_K + \nu_{R_\infty}$, $\nu_K + \nu_{M_2} - \nu_R$, $\nu_K + \nu_{M_2}$, $\nu_K + \nu_{M_1} - \nu_{M_2}$ and $\nu_K + \nu_{M_1}$, where the subscripts K, M_1, and M_2 denote energy for K, M_1, and M_2 shells, R the resonance level (optical), and R_∞ the change from resonance level to infinity.

	$A-B$	$A-C$	$A-D$	$A-E$	$A-F$	$A \rightarrow$
Observed	4·0 v.	10·9 v.	15·5 v.	19·2 v.	27·3 v.	above 50 v.
Calculated	4·2 v.	8·9 v.	13·4 v.	17·6 v.	27·4 v.	„ 40 v.

Similar calculations have also been made in the case of potassium and calcium in close agreement with the observed values of Lindsay and Van Dyke (*Phys. Rev.*, **28**; 1926). Details of the calculations, the mechanism of double absorption, and also the question of intensity will be dealt with in a subsequent communication.

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Calcutta, Sept. 27.

An Experimental Test of Schrödinger's Theory.

ACCORDING to Schrödinger's theory, the intensity of an expectral line in emission is not determined by the number of atoms in the higher level and the coefficient of expontaneous emission, but by the populations of both the higher and the lower levels corresponding to that line. If we have then two lines emitted by the same higher level, their relative intensity ought to change if we change the relative population of the lower levels, and furthermore, the change in the relative intensity of the lines should be equal to the change of the relative populations.

This conclusion has been tested experimentally, using mercury vapour at room temperature, optically excited, in which the two lines 4358 A. and 4046 A. emitted by the same higher level 2^3S_1 appear in fluorescence with great intensity. The relative population of the two lower levels 2^3P_1 and 2^3P_0 can be changed several hundred times by introducing a few millimetres of nitrogen or water vapour into the tube containing the mercury vapour. In fact, when mercury vapour alone is in the tube, the absorption of 4358 is several times stronger than the absorption of 4046, showing that the population of the resonance level is several times greater than the population of the metastable level; if a few millimetres of nitrogen or water vapour are now admitted in the tube, 4046 is very strongly absorbed and the intensity of the lines 4358 and 4046 in fluorescence increases about twenty-five times as found by R. W. Wood. A simple calculation shows that the number of metastable atoms must be now at least 100 times larger than the number of resonance atoms (see E. Gaviola, "The Influence of Foreign Gases on the Optical Excitation of Mercury," appearing in *Phil. Mag.*).

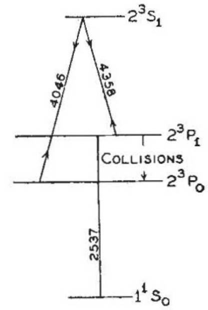

FIG. 1.

The enormous increase in the number of metastable atoms is due to the fact that collisions of the second kind with foreign gas molecules bring resonance atoms down to the metastable level, where they accumulate owing to the long mean life of this level. The relative population of the two lower levels has changed, then, at least several hundred times, due to the admission of gases, and, according to the theory, the ratio of the intensities of the lines 4358 and 4046 in fluorescence should also change in the same proportion. This ratio has been carefully measured without and with foreign gases, avoiding re-absorption of the fluorescence lines in the excited vapour by using a very narrow beam of primary light, and choosing such a pressure of the foreign gas that metastable atoms do not diffuse out of the illuminated region, and the result is that the ratio mentioned is equal to 2 in the case of mercury alone and equals 2 in the presence of nitrogen or water vapour. This proves conclusively that in our case the ratio of the intensities of the lines in emission does not depend on the populations of the lower levels, in contradiction with the common interpretation of Schrödinger's theory.

Details of calculations and measurements will appear in another place.

The experimental part of this investigation was done in Prof. R. W. Wood's laboratory in the Johns Hopkins University.

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Oct. 6.

Work and Place of Amateurs in Science.

IN NATURE of Aug. 18, under the heading of "Biography in American Science," attention is directed to the scarcity of amateur scientists, that is, to that class of them who have reached some degree of success in research. The word amateur, however, in its common meaning is applied to a large number of persons who are inexperienced and with only a superficial knowledge of the subject. Most of these are entirely different from the amateurs referred to in the article in NATURE, and we need to coin a new word or term to designate the amateur scientists who are experienced in research and have a broad knowledge of the subject.

The word amateur in its strict and original meaning is rather complimentary. But in our dictionaries, immediately following the word amateur is the word amateurish, which is defined as "Superficial or defective like the work of an amateur." So this definition is a rather uncomplimentary reflection on the amateurs.

The term amateur scientist as it is commonly understood might include all persons who are naturally interested in some scientific subject and make a study of it; the time devoted to it and their knowledge of their subject may vary greatly with different