To investigate the situation, I have studied the problem of the interaction of two identical atoms, each with one p valence electron. These give rise to the following[2] molecular states: $^1\Delta_g$, $^3\Delta_u$, $^1\Pi_g$, $^1\Pi_u$, $^3\Pi_g$, $^3\Pi_u$, $^1\Sigma_u^-$, $^3\Sigma_g^-$, $^1\Sigma_g^+$, $^1\Sigma_g^+$, $^3\Sigma_u^+$, $^3\Sigma_u^+$. These are thus twelve states, and *a priori* it is not evident in what order their energies occur, and which of them correspond to repulsive states. It seems that one must ascertain this by a calculation similar to that of Kemble and Zener[3] for the two-quantum excited states of H_2. This has been done in the present work.

In order to avoid analytical difficulties (and at the same time to follow the work of Zener)[4] an atomic wave-function with the radial part $R(r) = \text{const. } re^{-kr}$ has been adopted. Since we are not primarily interested in the absolute values of the energies, but only in their relative positions, it would seem that this assumption is sufficient. A complete treatment would also include other wave-functions but the work has been quite complicated in the above case, which is probably the simplest of all.

When, now, the potential energy for a given value of kR (where R is internuclear distance) is calculated, it is found to be proportional to k, so that the relative positions of the states are not influenced by a change in k. This is true for any function of the form $R(r) = \text{const. } r^n e^{-kr}$.

The complete potential energy curves have not as yet been obtained, but for the special value $kR = 6$, it is found that the lowest state is a $^1\Sigma_g^+$. The other $^1\Sigma_g^+$, together with $^1\Delta_g$ and $^3\Sigma_g$, are repulsive, while all the remaining states, including $^3\Delta_u$ and the Π states, seem to be attractive. Whether any of the states cross each other or not is not as yet known.

A full account of the work, together with various numerical tables will be published as soon as time permits.

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[2] See R. S. Mulliken, Phys. Rev. **36**, 611 and 699 (1930).

[3] E. C. Kemble and C. Zener, Phys. Rev. **33**, 512 (1929).

[4] C. Zener, Phys. Rev. **36**, 51 (1930).

The Probable Number of Isotopes of Eight Metals as Determined by a New Method

In our study of some twenty-five metallic elements in inorganic compounds (Phys. Rev. **35**, 124, 1930; a detailed report of our results is in Press in the *Journal of the American Chemical Society*) we have found that the number of minima of light, or so-called differential time lags, characteristic of each compound is in general the same as the number of known isotopes of the metal. This is true whether the metal be in the chloride, sulphate, nitrate or hydroxide form, a rather extensive series of each having been studied. The same has been found true more recently for several other inorganic salts which we have had the opportunity to study. The method therefore appears to afford a new means of determining the number of isotopes of the metallic elements. It is really to be expected, in the light of our previous experimental results, that each isotope would produce a separate minimum of light corresponding to its mass, for we have found that the positions of the minima of the inorganic compounds are some inverse function of the chemical equivalent of the metallic element of the compound. The scale readings of the minima of the isotopes of a given element, however, appear in general to vary directly with the masses of the individual isotopes, a conclusion which is based upon the order in which the minima characteristic of the given element make their first appearance as the concentration, beginning with extreme dilution, is gradually increased.

It occurred to us to find the number of characteristic minima of some elements of which no isotopes have been reported. We have therefore recently made a study of the elements listed below, finding for each the number of minima indicated.

Gold,	2	minima.
Palladium,	3	"
Platinum,	2	"
Rhodium,	1	"
Ruthenium,	2	"
Tantalum,	3	"
Thallium,	2	"
Thorium,	3	"

If, as seems very probable, our method detects the presence of the isotopes of the metals of inorganic compounds, our results are to be interpreted as showing that the above named metals have the number of isotopes represented by the number of minima recorded. These elements, for the most part, were studied in the chloride, sulphate and nitrate compounds and the number of the minima for each element was the same in each of the three compounds. Since the relationship connecting scale reading, or time lag, with atomic mass is not known with sufficient accuracy to yield values of atomic masses closer than some two or more units in the case of the foregoing metals, we are unable at present to determine the exact masses of these isotopes. This we believe may be possible, however, with further studies, along with a quantitative estimate of the abundance of the different isotopes.

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The Formation of Striae in a Kundt's Tube

Some experimental work has been carried on by the author from time to time on the formation of striae in a Kundt's tube. An article was written for Nature **118,** 157 (1926) also for Science and School Science and Mathematics the same year setting forth a method of producing these striae by means of a sounding organ pipe.

Since the summer of 1924 observations seemed to show a rotation of the dust particles on each side of the striae and in July 1929 the author succeeded in showing conclusively that such rotation does take place.

A glass tube about 150 cm long and about 2 cm inside diameter had some burned cork scrapings scattered along its inside and a sheet tin piston connected to one prong of an electrically driven tuning fork was used to excite the air vibrations in the tube. The piston was inserted a short distance into the end of the tube and the other end of the tube was closed with a tight fitting cork. When the fork was made to vibrate complete disks of cork dust were produced across the tube at the antinodes and close observation showed that at each disk two distinct orbits of rotating particles were present, one on each side of a single striation, one clockwise, and on the opposite side a counterclockwise rotation. The rotations take place so that the particles leave the top of the striation and enter at the bottom of the same striation. Midway between two adjacent striae little striae lower than the others tend to form but are soon destroyed by the rotations mentioned above, the dust particles forming these lower striae being pulled away in opposite directions and forced into the two adjacent striae at the bottoms of the same. Thus the dust particles are pulled away from a line approximately midway between adjacent striae in opposite directions and forced into the major striae at their bottoms. When the agitation of the dust particles is violent the striae at the antinodes, especially those extending completely across the tube as disks, do not remain always in one position but very often they merge into each other. When the agitation is less violent as in the case were the striae do not extend completely across the diameter of the tube from top to bottom, there seems to be two orbits of rotation on each side of a striation, one above the other, rotating in opposite directions so that the direction of rotation is from near the middle of the striation, one orbit entering the top of the striation, and the other orbit entering the bottom of the striation, somewhat as two meshed cogs one directly above the other, would rotate.

While there seems to be experimental evidence in the scientific literature for the support of the explanation of the formation of striae in a Kundt's tube as given by Koenig, Wied. Ann. t XLII, pp. 353, 549, 1891, the author is inclined to believe that the formation of these striae may be satisfactorily explained in a manner similar to the explanation for the formation of ripple-mark in sand as given by Darwin, Proc. Royal Soc. Vol. 36, p. 18, Oct. 18, 1883.

In the summer of 1927 the author was able to maintain two paper segments, cut in a shape similar to a dust striation, upright in the tube and when pith dust was also present a violent somewhat elliptically shaped rotation about an inch long along its major axis parallel to the axis of the tube, was produced. Also a single segment of paper similar to a dust striation has been maintained upright in the tube for a short time by means of the air vibrations.

In the summer of 1927 striae were obtained by the author by allowing puffs of air produced by interrupting a continuous air stream