LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the twenty-eighth of the preceding month; for the second issue, the thirteenth of the month. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

On the Interpretation of the Selective Photoelectric Effect from Two-Component Cathodes

A paper by Mr. A. R. Olpin with the above title appeared in the November 1st issue of the Physical Review. [**38**, 1745, 1931] Mr. Olpin calculates the wave-length of maximal response for a series of alkali hydrides, alkali oxides and alkali sulphides with a striking precision. His interpretation is based upon the Campbell-Fowler theory with the modification that the distance *d* between successive atomic layers occurring in the expression derived by Fowler has been correlated to the interplanar spacings in crystals of the compounds dealt with.

The object of this letter is to point out that the amazing agreement which Mr. Olpin finds is purely accidental.

Recently Zintl and Harder (Zeits. f. physik. Chemie B. **14**, 265, 1931) have determined the crystal structures of the alkali hydrides. The lattice constants which they give are rather different from those used in Mr. Olpin's calculations as the following table shows:

	Zintl and Harder	Olpin
LiH	4.084A	4.10A
NaH	4.880	4.50
KH	5.700	5.20
RbH	6.037	5.52
CsH	6.376	5.84

The next table shows the wave-lengths of maximal response as calculated on the basis of the correct spacings as compared to the observed wave-lengths.

	Calc.	Obs.
LiH	2750A	2800A
NaH	3930	3400, 3300
KH	5360	4350
RbH	6010	4800
CsH	6710	5400

It will be seen that there is no quantitative agreement except for LiH.

The spacings which Mr. Olpin uses in his calculations for the oxides and sulphides are not correct either, so that the agreement which he finds also for these substances is fictive.

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December 3, 1931.

"Regular Reflection of X-rays from Quartz Crystals Oscillating Piezoelectrically." Some Interpretations

Fox and Cork (Phys. Rev. **38**, 1420 (1931)), with a Y-cut quartz plate as the reflecting crystal in a Bragg spectrometer failed to detect any effect of piezoelectric oscillations on either the intensity or width of the reflected line. In view of the magnitude of the intensity effect usually observed this null result requires explanation.

An important fact to be considered in connection with this result is that it was obtained by surface reflection from the quartz plate, while all other positive results (Fox and Carr; Barrett; Nishikawa, Sakisaka and Sumoto; Barrett and Howe) were obtained by transmission through the quartz plate. It has been shown (Sakisaka, Proc. Phys.-Math. Soc.

Japan **12,** 190 (1930)) that with Mo$K\alpha$ rays reflecting from the surface of quartz, there is no appreciable contribution to the reflected beam from depths in the crystal greater than about 0.12 mm, either when the crystal had a "clean natural face" or when it has a ground surface. Fox and Cork, then, observed in their experiment the reflecting characteristics of the outer tenth millimeter or so of their half-millimeter thick crystal.

In grinding crystals to shape the surfaces become imperfect and intensely reflecting. These imperfect surface layers extend to a depth of about 0.1 mm (Sakisaka, Jap. Jour. Phys. **4,** 171 (1927)) and are not entirely removed by etching for a few minutes, nor by polishing. It is likely that such a layer on the reflecting surface was the seat of practically all of the reflected energy in Fox and Cork's experiment. Their result could be explained by saying that the reflecting layer was already so imperfect that oscillations could not add appreciably to this imperfection and therefore could not appreciably alter the line width and intensity. Sakisaka and Sumoto (Proc. Phys.-Math. Soc. Japan **13,** 211 (1931)) explain in this manner the unchanged surface reflection from quartz when the quartz is subjected to a temperature gradient.

Another interpretation of the negative result is possible that might be valid even with a thoroughly etched surface. Barrett and Howe found the reflecting power of oscillating quartz to be such as to indicate not a condition of random imperfection in the lattice, but, instead, a condition resulting from directed strain gradients. Regions of a crystal may be found where the reflecting power of a plane is practically unchanged by oscillations. The condition of strain in Fox and Cork's oscillating crystal may have been such as to have no effect on their reflected beam. There is too little known at present about the distribution of reflecting power as a function of mode of oscillation, type of cut, accuracy of cut, crystal dimensions and circuit interactions to be able definitely to accept or reject this interpretation.

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Note on "The Range of Fast Electrons and Neutrons"

In the Physical Review, November 1st, 1931, Messrs. J. F. Carlson and J. R. Oppenheimer,[1] writing on the range of electrons and hypothetical neutrons, make a number of statements which more extensive knowledge of the published experimental facts would have prevented.

(1) To speak of the thinness of the tracks of fast β-rays is misleading; one can really only refer to the line density of droplets which are individually observed in photographs taken under properly controlled conditions.

(2) In 1929, Skobelzyn[2] pointed out from the evidence of track photographs that the number of ions produced per centimeter of a cosmic straight track differs, if at all, but slightly from the number observed under the same conditions in the case of the fastest β particles of radioactive origin.

(3) In the case of radioactive β-rays the exact variation of ionization per centimeter with $\epsilon = (1 - v^2/c^2)^{-1/2}$ is known experimentally,[3] and instead of ionization per centimetre increasing with log ϵ, as theory requires according to Messrs. Carlson and Oppenheimer, it decreases. Nevertheless, they say that their "result makes it hard to believe that the particles observed with cosmic rays are electrons or protons since they are observed to ionize less than slower β particles". This reasoning is based on obvious contradiction of the experimental facts.

(4) With regard to the radioactive emission of neutrons from nuclei they write, "it would be of extreme interest to see whether in such a disintegration (radioactive β-ray) thin tracks of the kind observed by Mott-Smith could be found". For the benefit of the writers of this sentence it seems necessary to point out that this experiment has been performed on every occasion in which a β-ray source has been used in an expansion chamber, and that no evidence whatsoever for the emission of neutrons has been obtained.

[1] Carlson and Oppenheimer, Phys. Rev. **38,** 1787 (1931).

[2] Skobelzyn, Zeits. f. Phys. **54,** 686 (1929).

[3] Williams and Terroux, Proc. Roy. Soc., **A, 126,** 289 (1930).