

tube is satisfactory), no trouble is experienced in measuring currents of the order of  $10^{-9}$  amperes, and maintaining a very quick period instrument.

Finally, Dr. Price refers to an accuracy of less than 1 per cent. as being possible with the selenium cell apparatus. With the photo-electric cell apparatus  $\frac{1}{10}$  of 1 per cent. can easily be obtained, but such great accuracy is largely rendered valueless for many photometric purposes, because it seems impossible so to develop any plate, which has been uniformly exposed, that the resulting density will be uniform all over within, say, 5 per cent. (0.02 on the usual logarithmic density scale). If any photographic plate maker would take up this question, and produce a plate, and method of development, whereby really uniform densities could be obtained, he would be doing a very great service, since photographic photometry seems, at present, limited only by this cause.

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### The Phosphorescence of Fused Transparent Silica.

MAY I add a few observations on this phenomenon to those recorded by Messrs. Chapman and Davies in their letter to NATURE of March 1? From time to time during the last four years or so, after running silica discharge tubes containing helium, I have noticed a fairly bright and very persistent greenish phosphorescence. Supposing that this effect must be well known, at least to those using silica discharge tubes, I made no special experiments at the time in connexion with it, but the following recent observations suggested by the above letter may be of some interest.

(1) A silica tube containing hydrogen at rather low pressure, which had not been run for nearly four months, showed the phosphorescence quite distinctly on being exposed to the hot air blast from a blowpipe flame. It could be observed in all parts of the apparatus, even in those remote from the direct discharge, as, for example, a large bulb connected to the side of the H-shaped discharge tube.

(2) The phosphorescence having been destroyed by heating the tube to redness, it was at once restored when the tube was again run, if only for a second. But in the case of such a brief "exposure" as this it appeared only in the capillary, and faded away in about ten seconds. Several minutes' running was necessary to develop the phosphorescence in the farthest parts of the apparatus.

(3) With uncondensed and condensed discharges the distribution of the phosphorescence was markedly different. Whereas in the former case it was much brighter in the capillary than in the side tubes (the uprights of the H), in the latter case it was only slightly brighter in the capillary. There is, of course, a considerable difference in the distribution of the luminosity of the discharge in the two cases, a difference which is chiefly due to the high intensity of the Balmer series in the capillary when the uncondensed discharge is employed. Another point which may be significant is that the ends of the side tubes opposite to the electrodes (and farthest from them) showed brighter phosphorescence than the neighbouring sides.

(4) Another silica tube containing pure helium at much higher pressure (probably 1 cm. or more) was examined. A fairly heavy uncondensed discharge failed to develop the phosphorescence after twenty minutes' run, but it appeared after about a minute with a condensed discharge. The length of the spark-gap, *i.e.* the disruptiveness of the discharge, did not appear to matter much. A curious feature was that one of the side tubes glowed more brightly

than the other, and the former also showed the Balmer lines more strongly, although in both cases these were of low absolute intensity. Unfortunately it was not found possible to alter the relative strengths of the Balmer series in the two limbs, but the observation gains in significance when considered in conjunction with the absence of phosphorescence after passing an uncondensed discharge, since in the latter case no hydrogen was visible.

These observations, so far as they go, would appear to indicate that the phosphorescence is due to the ultra-violet radiations (constituting the "Lyman" series) of atomic hydrogen. These, it may be noted, lying as they do between  $\lambda 1216$  and  $912$ , are well within the absorption band of quartz, the centre of which is in the neighbourhood of  $\lambda 1030$ , and might therefore be expected to produce some such effect. Whether the radiating atoms in question are those which have been absorbed by the silica or merely those in the path of the discharge cannot be definitely ascertained from the present observations, neither does the experimental evidence adduced by Messrs. Chapman and Davies in support of the former view appear quite conclusive. For example, the effects both of liquid air and of heating are similar to those observed for many phosphorescent substances in the case of which there is no likelihood of any absorption of gas. The question should not be difficult to settle, however, by suitably devised experiments.

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### Fractional Crystallisation of Common Lead.

By fractional crystallisation of common lead, specimens were obtained which had different densities (NATURE, August 25, 1923). The densities given in that preliminary announcement were relative and not absolute. The absolute densities of two of the specimens were then determined; the same pieces of metal and also a piece of Stas lead were afterwards converted into lead sulphate in order to ascertain the relative atomic weights. The fact that I had to give up the work at this stage will serve as my justification for publishing the results without submitting them to further proof.

Common Lead.

Density at 20.49° C. (Wt. of			
1 c.c. in vacuo) . . . . .	11.358	..	11.327
Relative atomic weights . . . . .	207.07	207.15	207.19

Obviously the differences are so small that they must be confirmed before being accepted. Although the above results are not consistent with the theory that common lead is a mixture of 206 and 208, the end-products of the uranium and thorium disintegration series, it is nevertheless noteworthy that the two fractions fall on the periodic atomic volume curve of the elements. The freezing-points of the two fractions were identical, thereby excluding the possibility that the differences might be due to bismuth impurity in one case and thallium in the other.

The discrepancy between the preliminary and the final values which Richards and Craig (J. Amer. Chem. Soc., 1923, 1155) obtained for the atomic weight of gallium, namely, 70.1 and 69.7 respectively, may be due to a real change in the atomic weight of the material brought about in the course of the fractional crystallisation of the metal which was introduced as a method of purification after the preliminary values had been obtained.

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Cambridge, March 10.