electrical theory, viz., that of Maxwell and Lorentz. The complete clearing up of the problem of unipolar induction on the theoretical side is attributed to Larmor and Pegram. Reference is made to a recent paper on the subject by Swann, which gives the theory in detail, but contains little new material. The author's interpretation of his own experiments is given; and his earlier demonstration that they could not be used to settle the problem of unipolar induction is referred to, with critical comments.

The author's experiments on *electromagnetic induction and translatory motion* are briefly described and his earlier and later interpretations are referred to. The latter is identical with the interpretation published much later by Swann. The theory for both a strictly two-dimensional field and the actual case of the experiments is given according to Maxwell's theory by the method of the vector potential.

The results of the experiments on rotary and translatory motion are contrasted.

CARNEGIE INSTITUTION.

THE EXISTENCE OF SMALL IONS OF VERY HIGH MOBILITIES.

BY OSWALD BLACKWOOD.

SMALL ions of very high mobility have been found by Nolan¹ in the ionization from water spray and from radioactive bodies. He finds values more than *seven times* larger than that commonly accepted.

The results for spray ions are interesting since this field has been little explored. The ionization from radioactive bodies, however, has been investigated by many workers using methods much more precise than Nolan's. To the writer's knowledge no one has ever found such large values for ions in undried air. Since they have used methods which are much more accurate than Nolan's, the reality of his ions cannot be admitted even tentatively until their existence has been verified by other methods.

The writer presents evidence indicating that the results are, in fact, capable of another interpretation.

The apparatus consists of a plate condenser 25 cm. long and 10 cm. high, the upper plate being connected to an electrometer, while the potential of the lower one may be given any desired value. The radium emanation is contained in a leaden trough near one end of the charged plate. One centimeter above this trough is a lead shield which is supposed to limit the production of ions to the small volume immediately below it. A steady air current passes through the condenser carrying the ions forward while the electric field drives them vertically. At a critical voltage the beam of ions arrives at the electrometer plate and the current achieves its maximum value.

Nolan finds that the ions are driven to the plate when the voltage is far

¹ Proc. Royal Irish Acad., Vol. XXXIII. (A) (1916); Proc. Royal Society (A), Vol. XCIV., p. 112 (1918); Proc. Royal Irish Acad., Vol. XXXV. (A), p. 38 (1920).

below its critical value. He assumes that this indicates the presence of high velocity ions. The writer, however, shows conclusively that it is due to the fact that ions are produced not only in the constricted space below the shield, but also throughout the entire volume of the condenser. A wire screen electrically connected to the lower plate was placed one centimeter above it so that no ions produced under the lead shield should reach the electrometer plate. This screening reduced the electrometer current to only 75 per cent. of its former value, which showed beyond doubt that most of the ionization is produced in the upper part of the condenser. The difference between the two readings gives the electrometer current due to the ions formed near the lower plate. This corrected curve cuts the axis at the theoretical critical voltage and gives the commonly accepted mobility value for the small ion.

THE UNIVERSITY OF PITTSBURGH.

EFFECT OF LUNAR GRAVITY UPON A QUARTZ THREAD BALANCE.

By R. C. HARTSOUGH.

The Construction and Description of the Apparatus.—The construction of the balance is somewhat after Threlfall's "gravity balance." The chief addition is a long vertical lever arm and suspended mirror for magnifying small movements. This is due to Lord Kelvin in his "Lunar Disturbance of Gravity" experiments.

The shape of the apparatus is of a large T, the horizontal part is 60 cm. long and the vertical part is 50 cm. long. Instead of silvering, plating and soldering the mounting of the quartz thread, type metal was found entirely satisfactory and much surer and quicker of application.

These specifications of the apparatus will give a correct idea of the balance as used.

Size of quartz thread	0.04 mm. diameter
Length of quartz thread	55.7 cm.
Length of short weight-lever	2.0 cm.
Length of long observing-lever	26.5 cm.
Weight on weight-lever	0.10 gm.

Five complete twists were given each end of the quartz thread in order to hold the weight-lever horizontal and the observing-lever perpendicular.

The apparatus was enclosed in a T-shaped tube of brass and was evacuated to 0.03 mm. mercury pressure, and dried with phosphorous petoxide. The apparatus was placed in the basement on a solid base, however, passing trucks gave a very noticeable vibration. The temperature of this room was constant to within one degree in 24 hours. A galvanometer telescope-scale was used for observing deflections. Distance was 60 cm. The following readings and curve are typical of many taken.