concentrations) of the ions of the acid. These activities are shown to decrease with increasing concentration much more rapidly than do the ion-concentrations derived in the usual way from the electrical conductance ratio.

7. *Effects of Centrifugal Force on the Polarity of the Eggs of Crepidula:* EDWIN G. CONKLIN, Department of Biology, Princeton University.

It is difficult, but not absolutely impossible, to change the polarity of eggs and cleavage cells, and the persistence of polarity and the restoration of dislocated parts to normal condition is connected with a somewhat resistant framework of protoplasmic strands.

8. *The Emission Quanta of Characteristic X-Rays:* DAVID L. WEBSTER, Jefferson Physical Laboratory, Harvard University.

To excite any characteristic radiation it is necessary to use a potential above a critical value. The lines all increase in the same ratio for any given increase of potential. There is reason to believe that the characteristic rays are always a result of excitation of higher frequency oscillators.

9. *The Results of Investigations of the Ecology of the Floridian and Bahaman Shoal-Water Corals:* THOMAS WAYLAND VAUGHAN, U. S. Geological Survey, Washington, D. C.

The ability of corals to remove sediment from their surfaces, their mechanism for catching food, their carnivorous nature, their relation to light and temperature, and so on, have been studied.

10. *Cambrian Trilobites:* CHARLES D. WALCOTT, Smithsonian Institution, Washington, D. C.

Data have been assembled to aid in clearing up some of the problems of formations of the Appalachian region by a careful comparison of portions of their contained faunas with those of other localities.

11. *The Minute Structure of the Solar Atmosphere:* GEORGE E. HALE and FERDINAND ELLERMAN, Mt. Wilson Solar Observatory, Carnegie Institution of Washington.

The minute structure of the quiescent solar atmosphere resembles that of the photosphere. The results apparently support the hypothesis that the solar atmosphere consists of parallel columns of ascending and expanding gases, but such questions as the dimensions of the columns and the direction of motion and velocity are reserved for subsequent discussion.

12. *Monochromatic Photography of Jupiter and Saturn:* R. W. WOOD, Department of Physics, Johns Hopkins University.

The variation of the appearance of Saturn and Jupiter when photographed with light of different wave-lengths suggests a mist or dust in the planet's atmosphere which scatters the shorter wave-lengths.

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SPECIAL ARTICLES

PHOTOGRAPHS SHOWING THE RELATIVE DEFLECTION OF THE POSITIVE AND OF THE NEGATIVE IONS AS COMPARED WITH THAT OF THE ELECTRON

POSITIVELY and negatively charged ions, atomic in size (commonly called "retrograde rays"), *accompany* the stream of electrons issuing from the cathode in a highly exhausted discharge tube. Thomson[1] studied their properties by placing a photographic plate within the tube in such a position as to receive these rays after being deflected simultaneously by an electric and a magnetic field. When the fields are coincident (not crossed) the displacements on the photographic plate are in directions at right angles to each other. The photographic method is now in common use.

To the writer's knowledge no photographs, however, have been published in which all three of the component carriers—the positive ion, the negative ion and the electron—are shown simultaneously on the same plate. Since the mass of the electron is only 1/1700 that of the hydrogen atom, and since the square of the magnetic deflection varies inversely as the mass, it follows that the electron is driven off the plate by a magnetic field that would give the ion only an appreciably small deflection. By weakening the magnetic field the trace due to the electrons may be retained on the plate.

Two full-sized photographs, Figs. 1 and 2,

[1] J. J. Thomson, "Rays of Positive Electricity," pp. 75, 1913.

with key, Fig. 3, are submitted. Comparatively weak magnetic fields were employed.[2] The two coincident deflecting fields are sketched in Fig. 3, in which the direction of

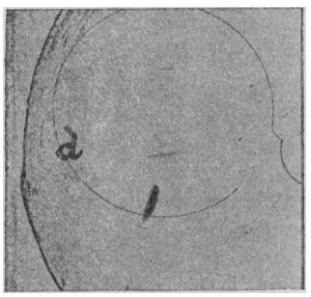

Fig. 1.

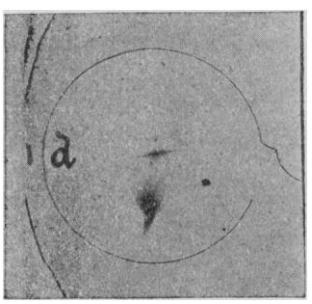

Fig. 2.

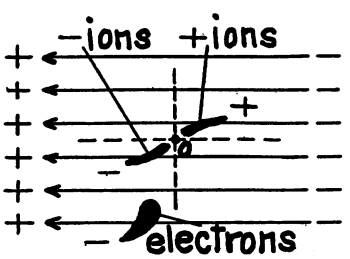

Fig. 3.

the electrostatic field is indicated by the minus and plus signs, while the arrow heads show the direction of the magnetic field. Again, magnetic deflections are up or down, while electrostatic deflections are to the right or left. The undeflected spot 0 is due to carriers that have lost their charge before entering the deflecting fields. In these photographs, Figs. 1 and 2, the traces due to the positive and negative ions unite at the central undeflected spot, the portion to the right of 0 being due to positive ions and that to the left negative ions, while the trace *e, due to electrons,* is distinctly separated from 0 and at some distance from it, and as we should expect, is in the same quadrant as the heavier negative ions. In Fig. 1 the time of exposure was 10 minutes, electrostatic field 2,070 volts per centimeter, magnetic field 1.7 amperes, and the vacuum .011 mm. mercury; while in Fig. 2 the corresponding values were 20 min., 2,070 volts, 2.25 amperes, and .005 mm. mercury. The effect of the stronger magnetic field is distinctly shown in Fig. 2 by the increased displacement from 0 of the trace due to the electrons.

[2] For arrangement of apparatus see C. T. Knipp, *Phys. Rev.*, Vol. XXXIV., March, 1912.

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION E—GEOLOGY AND GEOGRAPHY

The sixty-eighth meeting of Section E, Geology and Geography, of the American Association for the Advancement of Science, was held in Orton Hall, Ohio State University, Columbus, Ohio, December 28 and 29, 1915. Vice-president C. S. Prosser presided. Professor R. D. Salisbury, University of Chicago, was elected vice-president of the association, and chairman of Section E for the next meeting, to be held in New York. Dr. C. P. Berkey, Columbia University, was elected a member of the council, Dr. J. W. Beede, University of Indiana, a member of the sectional committee, and Dr. E. R. Cumings, University of Indiana, a member of the general committee.

The titles and abstracts of papers presented before Section E are given below:

The Classification of the Niagaran Formations of Western Ohio: Charles S. Prosser.

A series of sections along Ludlow Creek, near Covington and near Lewisburg in western Ohio, which extend from the upper part of the Richmond formation to near the top of the Niagaran series are fully described. Also the Derbyshire Falls section, near Laurel, Indiana, is described and it is shown that this important and well-known limestone extends into Ohio and is worked at several