curves of 125 variables in ω Centauri have been obtained.

Among other matters discussed by Professor Pickering in his report is the organization of the Observatory. The Harvard College Observatory is not, like many other observatories, divided into departments each under an astronomer of high grade. The Director himself is in immediate charge of all the departments, in many cases making a daily inspection and planning the work in detail. The assistants become skilful each in a particular work, and three or four times as many can be employed at a given expenditure as under the departmental system. The report mentions the advantages and disadvantages of each plan and advises that the plan in operation at Harvard should continue to be followed in one large observatory. The corps of assistants at Harvard and at the Southern Station, in Peru, includes forty persons.

THE PLANET DQ.

THIS planet has been named *Eros*. The *Astronomical Journal* and Circular 36 of the Harvard Observatory contain the gratifying announcement that numerous observations of the planet have been found on the Harvard plates in 1894 and 1896. In 1894 the planet was at its most favorable position for observation, and of the 7th magnitude when nearest. Observations have been found extending for more than four months, making it possible to determine an accurate orbit for that opposition alone. Dr. Chandler has undertaken the rigid discussion of all available data, and will bring the calculation down to the 1900 opposition, so that the observations then to be made will be under the best knowledge of the theory of the planet's motion.

This research has justified the policy of Professor Pickering in having the whole sky photographed at frequent intervals. That the plates thus accumulating contain a vast amount of material which the future needs of astronomy will utilize is quite evident. That many new facts can be obtained from their examination is shown by the discovery during the search for the planet Eros of two variables and two stars which are not in the Durchmusterung catalogue, besides observations of asteroids previously discovered.

WINSLOW UPTON.

BROWN UNIVERSITY, January 27, 1899.

NOTES ON PHYSICS.

SOME RECENT INVESTIGATIONS UPON THE BECQUEREL RAYS.

RUTHERFORD (*Phil. Mag.*, Jan., 1899), in an important and interesting paper, shows experimentally that in a mass of gas exposed to the radiation from uranium, thorium or their compounds the following statements hold good:

1. Charged carriers produced through the volume of gas.

2. Ionization proportional to the intensity of the radiation and the pressure.

3. Absorption of the radiation proportional to pressure.

4. Existence of a saturation current; *i. e.*, a current passing through the ionized gas, whose magnitude is such that all of the carriers produced by the radiation reach the electrodes.

5. Rate of combination of the ions proportional to the square of the number present.

6. Partial separation of positive and negative ions.

7. Disturbance of potential gradient under certain conditions between two plates exposed to the radiation.

It is also shown that the radiation given off by both uranium and thorium is complex, consisting of two varieties which the author calls α and β respectively; β being the one of greater penetrative power, whiie α is the one chiefly instrumental in causing ionization in gases. The intensity of the α radiation seems to depend chiefly upon the amount of surface of the uranium, while the β radiation depends upon the thickness of the layer.

In *Wied. Ann.*, No. 12, for 1898, Elster and Geitel give an account of a research undertaken by them to test the validity of two suppositions which have been made as to the cause of the Becquerel rays. Madame Curie (*Comptes Rendus*, CXVI., p. 1101) has suggested that the continuous radiation from uranium, thorium and their compounds may be explained by supposing all space to be filled with a sort of modified Röntgen radiation which possesses the power

of penetrating ordinary media to a much higher degree than the usual X-rays, and that in attempting to traverse substances having high atomic weights, like uranium and thorium, a portion of the incident energy is transformed into radiation having the power of affecting photographic plates, ionizing gases, etc. Elster and Geitel have tested this by examining the intensity of the uranium radiation by both the electrical and photographic methods, the apparatus being placed first upon the surface of the earth and then several hundred meters underground in a mine, their idea being that the intensity of the radiation incident upon the uranium would be weakened by passing through the overlying mass of earth. No difference was found in the intensity of the uranium radiations under the two conditions.

To test the hypothesis of Crookes as to the radiation being caused by a transformation by the uranium of a portion of the kinetic energy of the molecules of air, the intensity of the radiation emitted by the uranium when in a vacuum was compared with that emitted when the metal was in the air. No difference was found.

The results of this work are hence unfavorable to either hypothesis.

M. and Mme. Curie have shown (*Comptes Rendus*, CXXVII., p. 175) that in pitchblende there is a substance similar in properties to bismuth, but which is strongly radio-active, and for it they have proposed the name Polonium. In *Comptes Rendus*, CXXVII., p. 1255, they give an account of their more recent researches in which they have been associated with M. G. Bémont upon this subject. They are led to the conclusion that there is still another new substance present, similar in properties to pure barium, but whose chloride is about nine hundred times as active as that of uranium. The new substance, provisionally called Radium, is distinguished by a hitherto unknown line in its spectrum.

A. St.C. D.

BOTANICAL NOTES.

SARGENT'S SILVA OF NORTH AMERICA.

The appearance of Volume XII. of this magnificent work again directs attention to what will, for all time, be a monument to both author and publishers. Eight years ago the first volume appeared, and at more or less regular intervals the succeeding volumes, until the present one, which was originally designed to be the last. In these volumes we have 620 plates, thus more than making good the promise of author and publishers of fifty plates per volume. We have now the pleasant announcement by the publishers that, "as it has been found impracticable to include in this twelfth volume of Professor Sargent's great work the general index to the entire work, a thirteenth volume containing this index, together with descriptions and illustrations of recently discovered species, and such corrections of the original volumes as recent explorations have made necessary will be sent to subscribers without change as soon as ready."

The present volume includes descriptions and plates of *Larix* (3 species), *Picea* (7 species), *Tsuga* (4 species), *Pseudotsuga* (2 species) and *Abies* (10 species). We shall look with great interest for the appearance of the supplementary volume.

COMMENDABLE FREE-SEED DISTRIBUTION.

At last the United States Department of Agriculture has made a free distribution of seeds, which must commend itself to every scientific botanist or horticulturist in the country. We refer to the distribution to colleges of the sets of 'Economic Seeds,' prepared in the Seed Laboratory of the Division of Botany, by the lamented Gilbert H. Hicks, under the direction of Frederick V. Coville. The set as issued consists of five centuries, each enclosed in a shallow tray-like box, which is divided into rectangular spaces, each large enough to contain the seed-tubes. Each tube is numbered and labeled, and on the lid of the tray is an alphabetical list of all the species arranged under their appropriate families. It is a pleasure to note, moreover, that the most scrupulous care has been taken to secure accuracy in the nomenclature, which is of the strictly modern school, including double citation of authors and the uniform decapitalization of specific names. This distribution is a worthy and commendable labor of the National Department of Agriculture, and it reflects great credit upon the officers