The present report enumerates the position of all these stations, and tabulates the values of the declination, inclination and horizontal force as observed, and as reduced to the common epoch January 1, 1900. The data are also embodied in a series of charts. In the reduction to a common epoch the secular change was derived from numerous absolute observations made at Linden, Montgomery County; whilst diurnal variations were deduced from the records of the Naval Observatory, Washington. Unfortunately, owing to the disturbing action of electric trams at Washington, no satisfactory data were obtainable for the actual years occupied by the survey, and recourse was necessary to earlier records, mainly of the three years 1889 to 1891, particulars of which appear in the report. This, of course, is open to objection, on the ground that the amplitudes of the diurnal inequalities of the several elements vary from year to year. However, as both the magnetograph records and the field observations relate to years of relatively small sun-spot frequency, the objection is less serious than might appear at first sight.

Calculations are given of the probable errors in single observations with the instruments employed. The results appear fairly satisfactory in the case of the declination and inclination, but less so in the case of the horizontal force (*cf.* Table 18, p. 84). Dr. Bauer considers the weak point in the magnetometer—of the Geodetic Survey's old pattern—to have been the employment of wood in the deflection bar, and he states that the U.S. Survey is now procuring a superior type of instrument. One point that may be also worth reconsidering in this connection is the employment of 35 and 49 cms. as the two distances for deflections in horizontal force observations. Large distances have the advantage of reducing the uncertainties connected with the law of force between two magnets of finite size; but except in regions where the horizontal force is very low, distances such as 35 and 49 cms., with magnets of ordinary strength, imply small deflection angles, and the writer is inclined to think this may more than compensate for any theoretical advantage, especially in field work.

One of the interesting points discussed, and illustrated in the charts, is the existence of a considerably disturbed region near Gaithersburg, some twenty or thirty miles north-west of Washington. The abnormalities here were apparently first disclosed by special observations made with a view to the selection of a site for a magnetic observatory near Washington. The fact emphasises the dangers to which random choice of such a site may be exposed. At the end of the report there is an outline of a scheme for the complete mathematical investigation of the magnetic distribution in Maryland, but the working out of this and various other details is postponed, pending, apparently, the elaborate survey of the entire United States which the U.S. Coast and Geodetic Survey has now in contemplation. C. C.

SCIENTIFIC SERIAL.

American Journal of Science, March.—Studies of Eocene Mammalia in the Marsh collection, Peabody Museum, by J. L. Wortman. Part ii. Primates.—On ceric chromate, by P. E. Browning and C. P. Flora. An excess of chromic acid precipitates a ceric chromate of the composition $Ce(CrO_4)_2,2H_2O$ from solutions of cerium salts. Although the sulphates of lanthanum, didymium and yttrium were present, these metals were not present in the precipitate.—The effects of changes of temperature on permanent magnets, by H. B. Loomis. After giving a historical *résumé* of previous work on this subject, experiments are described showing the changes in the magnetic moment of magnets of different lengths, but of the same cross section, and on the change in distribution due to change of temperature.—On the chemical composition of axinite, by W. E. Ford. Expressed as an orthosilicate, the formula is found to be $Ca_7Al_4(SiO_4)_8$, in which the calcium may be in part replaced by varying amounts of Mn, Fe, Mg, and hydrogen, while a little Fe is isomorphous with the Al.—The electrical conductivity and absorption of energy in the electrodeless discharge, by Bergen Davis.—The geological structure of New Mexican Bolson Plains, by C. R. Keyes.—Note on the marine turtle Archelon. (1) On the structure of the carapace; (2) associated fossils, by G. R. Wieland.—The ionisation of water and of phosphorus nuclei, by C. Barus.—On a method of demonstrating Newton's rings by transmitted light, by H. N. Davis. If a number of wire rings of the same size be mounted in parallel planes, and dipped together in a soap solution, their planes being kept perpendicular to its surface, a series of films results through which light can be passed and caught on a sheet of paper, showing very beautiful colour phenomena.—Note on the amphibole Hudsonite previously called a pyroxene, by S. Weidman.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 26.—"An Attempt to Estimate the Relative Amounts of Krypton and of Xenon in Atmospheric Air." By Sir William **Ramsay**, K.C.B., F.R.S.

In these experiments 191·1 kilograms of gaseous air were passed into a Hampson's liquefier, and 11·3 kilograms of air were liquefied. This liquid air was evaporated in a partial vacuum, until only about 200 cubic centimetres remained. The residue, consisting largely of oxygen and also containing argon, krypton and xenon, was deprived of oxygen and nitrogen by means of red-hot copper and magnesium lime, and the resulting mixture was fractionated, so as to separate the argon, krypton, and xenon. Complete separation was not achieved, but knowing the densities and volumes of the fractions of gas obtained, their relative amounts could be calculated. This method does not preclude loss of the rarer gases, but that loss, especially in the case of xenon, must have been small; the vapour-pressure of krypton at the temperature of fractionation, $-195°$, being only 2·8 mm., and that of xenon, 0·02 mm.

The results are reproduced in the following tabular statement:—

Percentage krypton in gaseous air, 0·000014 by weight.

Percentage xenon in gaseous air, 0·0000026 by weight.

Krypton equal to 1 part by weight in about 7 millions of air; by volume, 1 part in 20 millions.

Xenon equal to 1 part by weight in about 40 millions of air; by volume, 1 part in 170 millions.

As before remarked, it is not maintained that all the krypton and all the xenon have been separated; it is likely, however, that the separation of the xenon was more perfect than that of the krypton. The results are merely brought forward as the result of a careful experiment to quantitatively isolate these gases.

As a quantity of pure krypton, sufficient for determination of density, had been collected, occasion was taken to redetermine the density of that gas, with the following result, that the value, compared with $O=16$, was found to be 40·81.

The atomic weight of krypton would accordingly be 81·62; the mean of former determinations is 81·28. This is in accordance with its position in the periodic table, which lies between bromine, 80, and rubidium, 85.

"An Inquiry into the Variation of Angles observed in Crystals, especially of Potassium-Alum and Ammonium-Alum." By Prof. H. A. **Miers**, F.R.S.

The author has endeavoured to trace the changes of angle upon one and the same crystal during its growth by measuring it at intervals without moving it from the solution in which it is growing. This is accomplished by means of a telescope-goniometer in which the crystal is observed through one side of a rectangular glass trough, and the changes in the inclination of each face are followed by watching the displacements of the image of a collimator slit viewed by reflection in it.

Examined in this way an octahedron of alum (ammonium or potassium) is found to yield not one but three images from each face; and closer inspection shows that the crystal is not really an octahedron, but has the form of a very flat triakis octahedron.

When a growing crystal of alum is watched for several hours or days, it is found that the three images yielded by an apparent octahedron face continually change their position; one set fades away and is replaced by another set.

The images do not move continuously, but *per saltum*, indicating that the reflecting planes are vicinal faces which