that between two charged wires as his starting point, he builds up by simple processes the most important practical cases. His paper concludes with a warning against the frequent use of the idea of potential in cases in which the simpler one of the electric field will give all the required information.

OUR ASTRONOMICAL COLUMN.

THE ORIGIN OF SOLAR ELECTRICITY.—Among the many interesting papers concerning astrophysical matters which appear in No. 8 of the *Monthly Notices* of the Royal Astronomical Society, attention may be directed to a convincing contribution to our knowledge of the agencies originating the vast solar electrical phenomena demonstrated by the brilliant researches effected at Mount Wilson. In a paper under the above title Dr. J. A. Harker applies the results of laboratory work conducted in collaboration with Dr. G. W. C. Kaye at the National Physical Laboratory to the explanation of cosmical phenomena. This experimental work has shown that at very high temperatures the vapours in the tube resistance furnace become highly conducting, and that under the same condition most refractory substances emit electricity carried by particles many times the mass of an atom of the substance. Calculations show that the measured emissivity of carbon at about 3000° C. would be ample to account for solar currents of magnitude sufficient to give rise to the intense magnetic fields Professor Hale has shown to be probably found in sun-spots.

THE TRUE FORM OF THE EARTH AND ITS INTERNAL CONSTITUTION.—Dr. A. Veronnet contributes a discussion of these subjects to No. 13 of the *Revue Générale des Sciences*. It is now known that this "somewhat irregular round body" on which we live has a rough sort of tetrahedral shape, but mathematicians must have a more generalised form, and thus for them the geoid is an ellipsoid of rotation of which the inverse of the eccentricity is about 297. Dr. Veronnet criticises the various formulæ which have been suggested to represent the hypothetical generating curve, and has himself proposed a new one. By considering the effect of variations of density and velocity of rotation limits are determined for the above-mentioned ratio, and it is shown that if the above value, found by Helmert, is supported, then the earth rotates as one piece. The author is also led to make some interesting conclusions regarding the effect of tides and causes of earthquakes.

COSMOLOGICAL HYPOTHESES.—At the Science Congress held at Lourenço Marques, Mr. R. T. A. Innes, of the Transvaal Observatory, dealt with this subject, and added one hypothesis more which he referred to as "the explosion hypothesis." He assumes that matter will not indefinitely submit to continued reduction of volume under indefinitely increasing gravitational pressure, but that a time will come when this pressure will "break into the atomic structure of its matter and cause explosions." By such explosions the sun threw off the planets and the latter their satellites; in other stars they caused the formation of multiple systems; new stars are due to the eruptive outbursts accompanying the explosions, and when on a smaller scale and rhythmical they are responsible for the phenomena of variable stars. Mr. Innes, we may remark, has shown an inexplicable eclecticism in choosing his foundation facts; for example, he has ignored the harmonious results obtained by modern workers on the temperatures of the individual stars, but has selected a contrary opinion to the effect that solar type stars are hotter than the white stars.

MAGNETIC SURVEYS.[1]

THE introduction tells us that this is the first of a series of volumes to be published dealing with the researches of the department of terrestrial magnetism of the Carnegie Institution of Washington, founded in April, 1904. These volumes, while principally on terrestrial magnetism, will contain memoirs on allied subjects, such as atmospheric electricity. The present volume treats of all the magnetic observations made *on land* by the department from the beginning of its observational work in 1905 up to the end of 1910. These observations are directed towards the accomplishment of one of the principal objects which the department has in view, viz. the acquisition of the data necessary for a general magnetic survey of the earth.

The first fifty pages deal with the general methods of work, the selection and description of stations, and especially with the field instruments and the taking and reducing of observations. The observational instruments—magnetometers, dip circles, and dip inductors—and auxiliary apparatus are handsomely illustrated in plates 2 to 6. Much experience of field-work has accumulated of late years at Washington, and the instructions to observers merit the careful attention of all interested in survey work. Pp. 51–6 introduce us to the results of the observations, which are chronicled in the later part of the volume. On p. 53 is a list of thirty-five observers whose work is included. Amongst them are several eminent foreigners, including Prof. Palazzo, of Rome, and Profs. Beattie and Morrison, of South Africa, who have observed for a time under the auspices of the Carnegie Institution. The stations observed at number almost 1300, of which more than 1200 are outside the bounds of the United States.

Of the continents, Africa shows the largest number of stations, 386, the great majority of which were occupied in 1907 and 1908 by Profs. Beattie and Morrison. Of the 328 stations in North America, 189 were in Canada or Newfoundland, fifty-nine in Central America, and nine in Greenland. In Asia there were 308 stations. Of these 142 were in China—occupied mainly by Messrs. Edmunds and Sowers—thirty-seven in Persia, thirty-two in Russian and eighty-one in Turkish territory. The observations in Asiatic Turkey were due mainly to Mr. Sligh, but partly to Mr. J. C. Pearson. The latter gentleman seems to have taken all the observations in Persia and in Asiatic and European Russia, and most of those in Egypt. He also observed in Canada, in European Turkey, at Pola, Potsdam, and Kew Observatories, and was amongst the crew of the surveying ship *Galilee*, who observed in Japan, Australia, and New Zealand. His experiences as a traveller should be of interest. Of the remaining stations, 111 were in South America, and 119 in numerous islands in the Pacific and Atlantic Oceans.

The tables of results, pp. 58–100, give for each station the geographical coordinates, the date and hours of observation, the observed values of magnetic declination, inclination, and horizontal force, the instruments used, and the observer's initials. Pp. 101–120 contain interesting extracts from the reports made by the several observers. The rest of the volume is occupied by minute descriptions of the stations, to facilitate their identification. An artistically attractive feature is the reproduction in plates 1 and 7–10 of a number of fine photographs, showing a selection of the stations occupied or scenes in their neighbourhood.

[1] "Researches of the Department of Terrestrial Magnetism. Land Magnetic Observations 1905–10." By L. A. Bauer, Director of the Department. Pp. 185+10 plates. (Washington, D.C.: Published by the Carnegie Institution of Washington, 1912.)