

lected at the cathode, which floated upon the liquid, and which, when washed and dried, was analysed by heating in a tube retort; five grains of the zinc compound gave 0.73 of a cubic inch of permanent gas, which on examination proved to be nitrogen with one-fourth hydrogen. The same quantity of the cadmium compound gave 0.207 cubic inch of nitrogen with no admixture of hydrogen. A like weight of the copper compound gave 0.107 of nitrogen. No ammonia was evolved from either; and the author is inclined to think that the hydrogen yielded by the zinc compound resulted from the reaction of the metal upon combined water. The specific gravity of specimens of these substances which the author tried were respectively 4, 6, 4, 8, and 5, 9. A mixed solution of chloride of gold and hydrochlorate of ammonia, electrolyzed with platinum electrodes, gave a black powder of the specific gravity 10.3; five grains of which, being heated, gave only 0.05 cubic inch of gas. The author proceeds to observe, that the similarity in appearance and mode of formation of these compounds and of the mercurio-ammoniacal amalgam, is strong evidence of identity of constitution, and that the non-permanence of the latter substance is due to the mobility of the mercury; for if we place the compounds in similar circumstances, that is, solidify the mercurial one, or liquefy those of the other metals, the phenomena are perfectly analogous. The experiments also bear immediately upon those of Thénard, Savart, and others, where ammonia, passed over heated metals, was found to be decomposed more completely by the oxidable than by the inoxidable metals, and to alter their physical characters without materially increasing their weight. On examining papers connected with this subject, the author found that Mr. Daniell had cursorily noticed a deposit somewhat analogous to those here treated of, which was formed upon the negative plate of his constant battery when this was charged on the zinc side with hydrochlorate of ammonia, and the nature of which that gentleman observed was worthy of further examination, but had not had time to investigate.

---

February 11, 1841.

The MARQUIS OF NORTHAMPTON, President, in the Chair.

The Right Hon. Sir Richard Hussey Vivian, Bart., G.C.B., &c., and Samuel Cartwright, Esq., were balloted for, and duly elected into the Society.

A paper was read, entitled, "Contributions to Terrestrial Magnetism, No. 2." By Major Edward Sabine, R.A., V.P.R.S.

This paper is the second of a series, in which the author purposes to communicate to the Royal Society the results of magnetic observations in different parts of the globe, having for their object to

c

supply the requisite data for deducing the numerical elements corresponding to the present epoch of the general theory of terrestrial magnetism. It consists of two sections; the first comprises the observations of Captain Belcher, R.N., and the officers of H. M. S. Sulphur, at twenty-nine stations on the west coast of America, and the adjacent islands, between the latitudes of  $60^{\circ} 21' N.$  and  $18^{\circ} 05' S.$  The second contains a new determination, by the same officers, of the magnetic elements at Otaheite, made in consequence of the discrepancies in the results obtained by previous observers, and of a note in M. Gauss's *Allgemeine Theorie*, in which Otaheite is spoken of as a highly important station for the future improvement of the calculations of the theory. Abstracts are given of the original observations which are deposited in the Hydrographic Office of the Admiralty, as well as a full detail of the processes of reduction by which their results have been computed. The values of the horizontal and total intensities are expressed in terms by which the results of observation are immediately comparable with the maps of MM. Gauss and Weber in the "*Atlas des Erdmagnetismus*."

By an investigation into the "probable error" of a single independent determination of the magnetic intensity with Hansteen's apparatus, derived from the data furnished by Captain Belcher's observations, the author shows the extreme improbability that the differences in the results obtained at Otaheite by Messrs. Erman, FitzRoy and Belcher, should be occasioned by instrumental or observational error. They are also far greater than can, with any degree of probability, be ascribed to periodical or accidental variations in the magnetic force from its mean value. The only known cause adequate to their explanation is what may with propriety be termed *Station error*; that is, local disturbing influences, in an island composed chiefly of volcanic rocks, and where the spot of observation selected by the different observers may not have been precisely the same.

By a reference to the magnetic survey of the British Islands, the occurrence of station error is shown to be frequent in countries of far less decided igneous character than Otaheite; and that its existence may always be apprehended where rocks of that nature approach to, or rise through, the superficial soil. The absolute determinations of fixed observatories are as liable to station error as those of the magnetic traveller, since no continuance or repetition of the observations can lead to an elimination of the error; it consequently presents a practical difficulty to the proposed determination of the elements of the theory from exact observation at only a few selected positions on the globe. The remedy is to be found in the combination of fixed observatories and magnetic surveys: the observations of the survey, being made in concert with, and based on those of the fixed observatory, will be furnished thereby with corrections for the secular, periodical, and accidental variations of the elements, and will consequently determine *mean* values: and a proper combination of the mean values thus determined, over a space sufficiently extensive

to neutralize *district* anomalies, as well as those of a more strictly local character, will furnish, in their turn, a correction for the station error, if any, of the fixed observatory.

A paper was also read, entitled, "On the Calculation of Attractions, and the Figure of the Earth." By C. J. Hargreave, B.A., of University College. Communicated by John T. Graves, M.A., F.R.S., Professor of Jurisprudence, University College, London.

The principal object of the calculations contained in this paper is to investigate the figure which a fluid, consisting of portions, varying in density according to any given law, would assume, when every particle is acted upon by the attraction of every other, and by a centrifugal force arising from rotatory motion. That such has been the original condition of the earth has been assumed as the foundation of most of the mathematical calculations connected with this inquiry; although the hypothesis itself may admit of doubt. The principal difficulty of this problem consists in the computation of the attraction of a body of any given figure, and composed of strata varying in their densities according to any given law. In solving it, the author follows the steps of Laplace as far as the point where the equation, known by his name, first appears. It has, however, since been discovered by Mr. Ivory, that the theorem of Laplace is true only of spheroids of a particular kind, and consequently it is to this kind that Laplace's solution of the problem is restricted. The method given in the present paper is not confined in its operation to any particular class of spheroids; the coefficients of the series into which the required function is developed being determined absolutely, and without reference to the form of the spheroid to which they are to be applied. The principal change consists in the different manner of treating the partial differential equation; and its integration, effected by the author, renders the analysis more direct, the operations more simple, and the theory complete.

---

February 18, 1841.

The MARQUIS of NORTHAMPTON, President, in the Chair.

Sir Richard Jenkins, G.C.B., &c., John Clendinning, M.D., and Eaton Hodgkinson, Esq., were balloted for, and duly elected into the Society.

A paper was in part read, entitled, "Memoir on a portion of the Lower Jaw of an Iguanodon, and other Saurian Remains discovered in the strata of Tilgate Forest, in Sussex." By Gideon Al-gernon Mantell, Esq., LL.D., F.R.S.

---