ments prior to the great perturbation in this year are determined, and have been already transcribed in NATURE; they present a resemblance to those of the first comet which appeared in 1798, about which year Brorsen's comet might have been in perihelion; Dr. Harzer nevertheless expresses the opinion that, although Messier's observations of the comet of 1798 might be open to some degree of uncertainty, it is doubtful whether they would admit of being represented by an elliptical orbit with a short period. He had found the revolution prior to 1842 to be 5·170 years.

THE NAUTICAL ALMANAC.—The volume of this ephemeris for 1887 has been published during the past week, the contents being generally the same as in previous years. The track of the total solar eclipse of August 19 is given in detail for the greater part of the course, and the maximum duration of totality is found to be 3m. 50s., the central eclipse with the sun on the meridian falling in longitude 102° 0′ E. and latitude 53° 47′ N. The Greenwich list includes four occultations of *Aldebaran* during the year and one of *Regulus*.

The average annual sale of the *Nautical Almanac* during the last five years has exceeded 15,500, though many maritime nations have now their nautical ephemeris.

THE PHILOSOPHICAL SOCIETY OF GLASGOW

THE *Proceedings* for 1882-83, pp. 592, 23 plates, and 3 maps, have just been issued, and contain the following papers:—On insensibility arising from a deficiency of oxygen in the air, by Dr. Wallace, president; on technical education, by David Sandeman and E. M. Dixon, B.Sc.; on the decay of building stones, by Dr. Wallace; on some new infusoria, by William Milne, M.A.; note on Lippmann's capillary electrometer, by Dr. McKendrick; on milk and milk pollution, by Dr. John Dougall; on Struther's process for pulverising diamondiferous ore, by Wallace Fairweather, C.E.; on the use of litmus, methyl orange, phenacetolin, and phenolphthalein as indicators, by R. S. Thomson; on approximative photometric measurements of sun, moon, cloudy sky, and electric and other artificial lights, by Sir William Thomson; on the preservation of food by cold, by J. J. Coleman; on the clauses in the Glasgow Police Bill having reference to the prevention and mitigation of disease, by Dr. Ebenezer Duncan; on the ships and shipping trade of Great Britain, by N. Dunlop; on the iron ore industry of the north of Spain, by J. J. Jenkins; on the use of rosolic acid as an indicator, with additional notes on phenolphthalein and methyl orange, by R. S. Thomson; on architecture in Glasgow, by J. Sellars, jun., I.A.; on the water highways of the interior of Africa, with notes on slave hunting and the means of its suppression, by James Stevenson, F.R.G.S.; on a new seismograph, by Thomas Gray, B.Sc.; on the fertilisation of flowers, by Rev. A. S. Wilson, M.A.; on algin, a substance obtained from some of the commoner species of marine algæ, by E. C. C. Stanford; on chemical industries, by R. R. Tatlock; on nitroglycerine, dynamite, and blasting gelatine, by George McRoberts, manager of the Works of Nobel's Explosives Company; on the action of heat and the chlorides of phosphorus upon the water salts of hypophosphorus, phosphorus, and phosphoric acids, by Dr. Otto Richter; on a volumetric process for the estimation of cobalt and nickel, by Dr. John Clark; and, on the development and generic relations of the corals of the carboniferous system of Scotland, by James Thomson, F.G.S.

The society has at present 19 honorary, 10 corresponding, and nearly 700 ordinary members, and is about to enter on its eighty-first session. In addition to the ordinary meetings of the society, held fortnightly, there are sections for architecture, biology, chemistry, sanitary science and social economics, and geography and ethnology.

RESEARCHES ON SPARK SPECTRA

The Disappearance of Short Lines

IT was shown in a former Report of this Committee (Southampton meeting) that the spectra of metallic solutions were the same as those from metallic electrodes line for line, even short and weak lines being reproduced. The principal difference observable in the two spectra was a lengthening of the short lines when spectra were taken from solutions, so that discontinuous lines became long or continuous lines. A few instances of short lines disappearing have also been noticed, but such disappearances occur only when the lines are so short, mere dots, in fact, that no solution can contain a quantity of the metal sufficient to yield an image of them. Certain very short lines in the spectrum of metallic zinc are an example of this. Very short lines in the spectrum of aluminium were not reproduced by solutions of the chlorides except when the solutions were very strong, and then they always appeared. It may thus be seen that the quantity of metal present in the compound determines the presence of these lines.

The Lengthening of Short Lines.—It was remarked that in certain cases metallic electrodes showed a different spectrum according to whether the spark was passed between dry or wet electrodes. Thus it was pointed out that when iridium electrodes are moistened with calcic chloride, discontinuous lines which are very numerous in this spectrum become continuous; and on further examination into this matter it has been found that even moistening with water has the same effect. Hence the supposition, of which there seemed some possibility but no proof, that a chloride of the metal was formed is found to be untenable. The very short lines in the spectrum of zinc were lengthened by the action of water upon the electrodes. It has now been proved beyond doubt that this peculiar variation in the spectra is caused by the cooling action of the water upon the negative electrode, which in effect is the same as a strengthening of the spark, since by heating the electrodes a reverse action is the result.

Alterations in the Spectrum of Carbon.—As already stated in the previous Reports, graphite electrodes have been generally employed for the production of spark spectra from solutions. A portion of the work in connection with this subject included an investigation of the effect of water and of saline solutions in varying the spectrum of carbon. It will of course be readily understood that as carbon is capable of combining with oxygen and nitrogen, that different spectra might be obtained by making one or other of these gases the atmosphere surrounding the electrodes, but it is not so easy to explain why graphite points should give two different spectra in air when dry, and a third spectrum, again different, when moist, the same spark conditions being maintained.

Three such spectra have been photographed, but without the aid of maps their peculiarities are not capable of exact description. The maps which were drawn were presented to the Royal Society, together with a communication on this subject, three months since, so that they are not at present available. It may be said, however, that the difference between the two spectra taken from dry electrodes in air consists of the omission of a certain number of the less refrangible lines, which lines have undoubtedly been identified with carbon.

Spectra of the Non-Metallic Constituents of Salts.—A long series of experiments has been made with the object of determining the non-metallic elements which are capable of yielding spark spectra when in combination with the metals. Fluorides, chlorides, bromides, iodides, sulphides, nitrates, sulphates, selenates, phosphates, carbonates, and cyanides yield nothing. On the other hand, hydrochloric acid solutions of arsenites and antimoniates yield the spectra of arsenic and antimony. Borates and silicates in solution yield very characteristic spectra of the non-metallic constituents, but if the solutions be prepared from sodium salts the lines of the metal do not appear in the case of borates, and only the strongest sodium line ($\lambda = 3301$) can be observed in the spectra of silicates, even when concentrated solutions are used.

Line Spectra

BORON Wave-lengths	SILICON Wave-lengths
3450·1	2881·0
2497·0	2631·4
2496·2	2541·0
	2528·1
	2523·5
	2518·5
	2515·5
	2513·7
	2506·3
	2435·5

These are the first spectra of boron and silicon obtained from metallic salts.

[1] Report of the Committee on the Comparison of the Spark Spectra of the Elements with Spectra of Solutions of their Compounds, drawn up by Prof. W. N. Hartley.