

and the antiquary" form an exceedingly well assorted crew; and the addition of an American gentleman and his wife visiting Norfolk, whence his people originally came, "on genealogical searches intent," helps to make the fun of the voyage greater. From the first page to the last the pleasant banter never flags, and there is more real information both with regard to the topography, antiquities, and local peculiarities of the country through which they passed conveyed in this agreeable manner than in many a book of greater pretensions; whilst his specimens of the Norfolk dialect, as given in the story of the ghost of Instead Shoals, and other passages, are really excellent. The account of "Roger's Blast," at p. 51, and the adventure with the otter (p. 53), are exceedingly clever satires on the writings of a well-known author of "Broad" books, and the *finale* of the "Ancestor Hunt" is exquisite. The writer also ventures to tell the truth with regard to the too much vaunted shooting and fishing. The trip ended, as we suspect many another has done both before and since, by the companions getting just the least bit tired of each other, and the Americans departing to the much more congenial region of Scarborough, whilst the rest of the party returned to London. The maps are very useful, although mere outlines, and the pretty little sketches by Mr. Wilfred Ball charming.

The last book on our list is "Notes on the Broads and Rivers of Norfolk and Suffolk," by Harry Brittain, with sectional maps and illustrations. Like the preceding guide-books Mr. Brittain has adopted the narrative form, and conducts the reader in a very pleasantly written journal to all the principal points of interest on the rivers and Broads, with a sea trip to the quaint old towns of Dunwich and Southwold. Altogether Mr. Brittain has contrived to embody an immense amount of information in his 154 pages, including lists of fishing quarters, distance tables, table of high water at Yarmouth Bar, and a copy of the Bye-laws of the Conservators under the Norfolk and Suffolk Fisheries Act of 1877. He has, like Mr. Davies, the advantage of being a local man and an enthusiastic yachtsman, thoroughly familiar with the country, and therefore perfectly reliable; the illustrations are excellent and thoroughly characteristic, and the sectional maps, with which the text is interspersed, will be found exceedingly useful.

Some years ago a very florid article on the Broads appeared in a magazine giving such a glowing description of the abundance of fish that pike, it was said, were actually used for manuring the land, and the shooting was not less remarkably productive. The result was that a well-known naturalist residing in Norwich was flooded with letters of inquiry as to fishing and shooting quarters in this *El Dorado* of sport. His reply was that undoubtedly both fish and fowl were there, and that at certain seasons good bags of both could be made, but that unfortunately there were people selfish enough to imagine that they had some sort of proprietary right to what was found on their own land or in their own water; and as to trespassing on the snipe grounds which surround the Broads, so little right had the public that if any unfortunate individual should chance to fall into the water he must remain there till he had written to the owner of the soil for permission to land. This is literally true, with the exceptions of the towing-paths in the navigable rivers;

and visitors, whilst seeking the healthful pleasure undoubtedly to be derived from a trip on the Norfolk Broads, should be careful to respect the property and rights of the riparian proprietors.

#### OUR BOOK SHELF.

*Connaissance des Temps, ou des Mouvements Célestes à l'usage des Astronomes et des Navigateurs pour l'an 1888, publiée par le Bureau des Longitudes.* (Paris: Gauthier Villars.)

THIS valuable ephemeris has now reached its 210th volume in unbroken annual succession since its first publication by Picard in 1679. Its form and contents have undergone a wide development since that date, a development which is still in progress, for the present volume shows three additions on those of previous years. These are (1) the insertion of local time of the moon's transit for twenty-four successive meridians; (2) a development of the tables for transforming sidereal into mean time, and reciprocally, so as to render the performance of the calculation more rapid; and (3) the insertion of the co-ordinates of 65 southern stars, 5 being circumpolars for which ephemerides are given from day to day, the co-ordinates of the remaining 60 being supplied for every tenth day. The positions of the stars have been drawn from all the existing Catalogues, and from unpublished Cordoba observations communicated by the Director of the Cordoba Observatory, M. Thome.

*A Treatise on Analytical Statics.* With numerous Examples. By I. Todhunter, M.A., F.R.S. Fifth Edition. Edited by J. D. Everett, M.A., F.R.S. (London: Macmillan and Co., 1887.)

MESSRS. MACMILLAN have just issued the fifth edition of the late Mr. Todhunter's work on analytical statics, edited by Prof. Everett. In his preface the editor states that the most important changes he has made in the old matter relate to attraction, virtual velocities, and general theorems on systems of forces. He has added a brief chapter on graphical statics, a series of articles on the connexion between centres of gravity and resultants of forces at a point (with an exposition of vectors), and a new theorem on a string under a central force. The omissions include most of the articles on the attraction of ellipsoids, in conformity with the design of the book in its present form, which is intended to contain such a selection of subjects as may with advantage be studied in a first course of analytical statics.

#### LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

#### Measurements of the Heights and Motion of Clouds in Spitzbergen.

THE first measurements, as far as I know, of the heights and motion of clouds, by the method described by the Hon. R. Abercromby in *NATURE* for August 4 (p. 319), and practised at Upsala by M. Hagström and myself since the summer of 1884, were made in the summer of 1883 at Cap Thorselsen in Spitzbergen under the Swedish Polar Expedition stationed there, of which the chiefship as well as the guidance of the meteorological

observations had been committed to me by the Swedish Academy of Sciences. Those measurements having been made by the same instruments<sup>1</sup> and the same method as the Upsala observations, it will perhaps interest you to see some of the results. The measurements will soon appear *in extenso* in the publication of the works of the Expedition.

*Mean, greatest, and least heights of clouds at Cap Thorelsen (above the mean level of the sea).*

Name of Cloud.	Number of		Height in metres.		
	Measurements.	Clouds.	Mean.	Max.	Min.
Strato-cumulus ...	6	6	2464	3123	2032
Alto-cumulus ...	16	13	3229	5306	2126
Cirro-cumulus ...	7	3	6389	7411	5180
Cirrus ...	15	7	7317	8590	5676

For want of time the number of observations was rather small, but nevertheless the heights agree tolerably well with those obtained afterwards at Upsala. The mean error of a single determination of lower clouds (below 3500 metres), I have found to be 3.4 per cent. of the height of the cloud, that of a higher cloud (above 4700 metres) to be 16.6 per cent. We had two bases, but the longer one was not more than 572.6 m., as I could not, for that purpose, dispose of a greater length of wire for the telephonic line. This explains the great mean error found for the higher clouds. The greatest velocity observed for higher clouds was 27 m. per sec. at a height of 7300 m. The calculations are made by the method worked out by M. Hagström and myself in the summer of 1884, and fully described in our first paper on the subject ("Mesures des Hauteurs et des Mouvements des Nuages" in *Nova Acta Reg. Soc. Sc. Ups.*, ser. iii., Upsala, 1885).

Upsala, August 24.

NILS EKHMOLM.

#### Occurrence of Apatite in Slag.

I SHOULD like to be permitted to ask whether any mineralogical readers of NATURE have themselves come across, or have anywhere seen mentioned, the occurrence of crystallized apatite in a metallurgical slag or other artificially-formed silicate?

Having recently observed such an occurrence, I have been looking into the authorities I have at hand here to see whether any similar formation is previously recorded. The result is negative, and indeed Rosenbusch ("Mikroskopische Physiographie der petrographisch wichtigen Mineralien," 1885), after enumerating the various artificial preparations of the mineral, distinctly states that "the formation of apatite from fused silicate magmas has not yet succeeded." My former teacher, Prof. Weisbach, of Freiberg, who takes special interest in artificial formations of minerals, and carefully records all cases coming to his knowledge, writes to me that he is not aware of any instance of the occurrence of apatite crystals in a slag except in the case of the "Thomas slags" of the basic Bessemer process. These can, of course, not be classed as "silicate magmas," containing as they do so large a proportion of phosphoric acid, and a relatively small amount of silica; nor do they bear any analogy whatever to the silicate rocks in which we are accustomed to observe the occurrence of apatite in Nature.

The slag in which I have observed the formation of apatite is produced during the smelting of lead ores in a blast-furnace. It is a basic silicate of lime and ferrous oxide, containing about 30 per cent. of silica. The principal "flux" used in the reduction of the ore is "tap-cinder" from the puddling furnaces, and it is mainly from this source that phosphoric acid is introduced into the slag. The slag itself, in bulk, is dark brown to nearly black in colour. It flows into slag-pots of about 3 cwts. capacity, and cools slowly.

I recently prepared some thin sections of this slag for microscopic examination. The greater portion consists of a mass of crystals of olivine, surprisingly colourless and transparent considering how much iron is present. The spaces between the crystals are occupied by deep-brown and yellow amorphous slag, and black sulphides of iron, &c.

Both olivine crystals and dark amorphous matter are penetrated through and through by great numbers of apatite crystals in long needles. It is a most beautiful occurrence, analogous in every way to what one sees in rocks.

<sup>1</sup> The altazimuths employed were constructed by Prof. H. Mohn in Christiania for the use of the Norwegian, Swedish, and Danish Polar Expeditions.

Nearly all the apatite crystals have taken up and inclosed more or less of the amorphous dark material, which forms in the majority of cases a rod running down the centre, but there are also many cases of symmetrical arrangement of dark matter parallel to the sides of the hexagon.

The apatite does not only occur in the mass of the slag as above described; it is formed also in free crystals, lining cavities which are formed in the centre of the lumps of the slag owing to gases carried over from the furnace and liberated during cooling. Some of these cavities are of considerable size, and are often lined entirely with a thick growth of apatite needles, some as thin as the finest hair, others of much larger dimensions. I have taken out crystals over a quarter of an inch long for microscopic and chemical examination. Most of them contain a good deal of the amorphous slag, &c., inclosed, as in the case of those in the mass of the slag.

Sometimes in such cavities very beautiful little crystals of volatilized sulphides are seen among and on the apatites. I have seen galena crystals in this manner, but it is very difficult to remove them from the cavities without damage or loss.

It appears to me strange that while we have here so plentiful a formation of apatite going on constantly, in many tons of slag daily, it should still be on record that experiments purposely conducted with a view to obtaining the mineral in a silicate magma have not succeeded.

W. M. HUTCHINGS.

Eversley Park, Chester, September 3.

#### Electricity of Contact of Gases with Liquids.

MAY I be allowed to reply to Dr. Lodge (NATURE, Sept. 1, 412)? That the escaping gas was charged was proved (1) by collecting it in an insulated vessel; (2) by generating and collecting it in insulated apparatus. Electrification resulted in the first case, but not in the second. Details of these experiments I intend to publish later.

With all possible respect for Dr. Lodge I cannot accept his explanation of the electrifications I have described. I fail to see any analogy between Armstrong's machine and the experiments with zinc and hydrochloric acid which I have made, except, indeed, that, as I hold, they are all cases of contact electricity. Sir W. Armstrong directs a jet of steam against solid wood grooved and shaped to increase the surface of contact. In my experiment, on the contrary, I find that the effect is distinctly lessened when the hydrogen passes through narrow tubes or openings, and accordingly the strongest deflections are obtained when a large open dish is used. I take an evaporating dish, 8 or 10 inches in diameter, and put a small quantity of a 10 or 16 per cent. solution of HCl into it. The acid is at every point at least 4 or 5 inches distant from the edge of the dish. When a small fragment of zinc is thrown in a gentle effervescence is set up, the hydrogen shooting straight up through the middle of the liquid into the air. I submit that in this experiment whatever electrification results is due to gas and liquid, and not to gas and solid. Moreover, after a lapse of a few minutes when a sufficient quantity of ZnCl<sub>2</sub> gets into solution, the charge on the dish changes its sign. Is Armstrong's machine also in the habit of reversing itself? On this reversal of the electrification I base my case. The dish does not vary, but the liquid does, and its variation is accompanied by a change in the sign of the charge.

With regard to the atomic charges I do not hold that the charge on the hydrogen has anything to do with them. It is true that at first I set out to inquire as to the equality of these charges, but when I found that the charges on the evolved gas and the generator were of opposite sign, I was constrained to admit that the electrifications were not connected with the atomic charges as I had, during the earlier experiments, supposed. Had I found things the other way—that is to say, that the charge of the gas had been of the same sign as the charge on the generator—I should not have thought it at all improbable that the electrifications were due in some way to atomic charges. In fact, at the outset this is exactly what I thought I might possibly fall upon. However, the unexpected occurred.

"But that a gas should be thus electrified strikes one as improbable." Can this be so? Surely the distinguished champion of the "air effect," who has so stoutly maintained that the contact of copper or zinc with gas gives rise to a difference of potential, cannot consider it very improbable that the contact of a gas and a liquid should produce a similar effect. Perhaps it is well to remember that the hydrogen in these experiments is in the nascent state.

J. ENRIGHT.