

*Preparatory Physics.* By William J. Hopkins. (London: Longmans, Green, and Co., 1894.)

THE course here presented is the outgrowth of needs of the classes beginning the study of physics in the Drexel Institute, Philadelphia. It is arranged strictly for laboratory work, and although the ground covered is not very extensive, yet sufficient has been selected for a first course, and that expounded to a very full extent. Mechanics has been chiefly taken in hand, and the numerous problems have been so arranged that the student is able to investigate them experimentally for himself. A glance at the instructions and explanations shows one that the author wishes at every step to instil into the beginner the idea that habits of accurate and thorough observation must be developed, and, further, that students must be careful, complete, and orderly in recording and arranging his results. With this intention most of the experiments are accompanied with printed forms illustrating concise methods of recording the observations. The apparatus alluded to in the text is of a simple nature, and quite sufficient for those beginning the subject. As an introduction, a few pages are devoted to such fundamental points as units, errors and sources of error, coordinates, plotting of curves, &c. Altogether, the book will be found a serviceable and able help to all wishing to take part in the more simple laboratory work.

*The Story of the Stars.* By George F. Chambers, F.R.A.S. Pp. 192. (London: George Newnes, Limited, 1895.)

ONE or both of two qualifications are essential in a book designed for general readers: the text must be attractively written, or the illustrations must please the eye. This book has neither of these claims to public favour: the text is stodgy and the illustrations are the very worst that we have seen disfiguring a volume on astronomy. The former defect is due to the author's attempt to say something about the whole of sidereal astronomy in less than two hundred small pages; the wretched illustrations cannot be due to his inability to find others, so this fault must lie at the publisher's door. And yet we cannot understand why the publisher of the *Strand Magazine* and other pictorial papers could not give the same care to the illustration of a book on astronomy as he does to the description of the home of some celebrity. Only in regard to quantity of information are we able to say a favourable word for this book. Mr. Chambers is thoroughly competent to collect the facts belonging to the old astronomy, and to condense them. He may be able to compress a mass of knowledge into a small compass, but his latest production shows that he has not the touch *simplex munditiis* of a writer for the popular mind.

*Aërial Navigation: Proceedings of the International Conference held at Chicago, August 1893.* Pp. 429. (New York: American Engineer Office. London: Sampson Low, Marston, & Co., 1894.)

AN International Conference on aërial navigation formed one of the series of Congresses which were held in Chicago during the summer of 1893. The meetings proved to be successful, and the volume in which the proceedings are recorded shows that facts and positive knowledge, rather than speculations or descriptions of things "in the air," were the order of the day. Some thirty-five papers were presented, each containing an account of observations and results of experiments carried out by scientific men or experienced engineers. These papers and the discussions upon them are now published in a volume uniform with Mr. Chanute's treatise on "Flying Machines," previously noticed in NATURE (vol. I. p. 569, 1894). Both show that many of the problems of aeronautics and aviation are being treated scientifically. The present volume is of special interest to meteorologists, for it contains several papers on the exploration of the upper atmosphere.

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## LETTERS TO THE EDITOR.

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### The Liquefaction of Gases.

I DECLINE to follow Prof. Dewar into the fresh crop of irrelevant side issues raised by his letter in NATURE of February 28. The charge brought against Prof. Dewar, which I think I have amply substantiated, is that he has allowed the impression to go abroad that he has carried out much original research into the methods of liquefying the more permanent gases, and the properties of the liquids produced; whereas his experiments have been mainly repetitions of work done by others.

Prof. Dewar has not met this accusation. He has not proved that his methods for liquefying the more permanent gases are original methods, he has not even shown that for scientific purposes they are good methods; he has not proved that his experiments on the liquefied gases are either original or valuable; he has not attempted to rebut the actual facts, or to deal with the actual dates, brought forward by Prof. Olszewski and myself.

In his last letter Prof. Dewar gives a list of work "commenced and so far developed in the laboratory of the Royal Institution." The list might, however, have been made a little less grotesque by the omission of such thin s as "argon in liquid air," and the "liquefaction of hydrogen," and the substitution in place of these of a double &c.

When Prof. Dewar quits the region of romance, and tries to meet the definite statements I have made, and the evidence afforded by the dates I have quoted, I shall be ready to deal with his arguments to the best of my ability.

Cambridge, March 2.

M. M. PATTISON MUIR.

### Eleven-year Sun-spot Weather Period and its Multiples.

MANY years ago, investigations in regard to the existence of a period of about eleven years in the weather corresponding with the eleven-year sun-spot period were actively carried out in various parts of the world. Much data was accumulated in support of such a period, a large part of which was published in the earlier volumes of NATURE. But the investigations, as a whole, showed that the period was less marked or more complex than at first anticipated, so that recently less interest has been manifested in the subject, and indeed many express their doubts as to the existence of such a period.

One of the complexities which has helped to obscure the eleven-year period is the existence of what may perhaps be called weather harmonics, on account of the resemblance to harmonics in sound—that is, the existence of other periods related to the length of the first as 2, 3, 4, &c. Thus the existence of the eleven-year period is obscured by the existence of other periods of 22, 33, 44, &c., years.

If the reader will turn to the letter "On Some Temperature Variations in France and Greenland," in NATURE of October 11, 1894, he will find plotted the smoothed number of frost days and mean July temperatures at Paris for a large part of the present century. These curves show three marked waves in the temperature with the crests about 1825, 1848, and 1869, that is, almost exactly 22 years apart. If the dates of the chief maxima and minima of the individual curves are arranged under dates 22 years apart, as shown below, it will be seen that the dates closely approximate, thus:—

Mean dates of									
maxima	...	...	1825	...	1847	...	1869	...	1891
Frost days, Paris—									
minima	...	...	1824	...	1848	...	1868	...	1883
July temp. Paris—									
maxima	...	...	1826-34	...	1848	...	1870	...	1885
Mean dates of									
minima	...	...	1815	...	1837	...	1859	...	1881
Frost day, Paris—									
maxima	...	...	1814	...	1839	...	1856	...	1878-89
July temp. Paris—									
minima	...	...	1815	...	1842	...	1862	...	1881-90

If only the two highest maxima are considered, they occurred about 1826 and 1870, or 44 years apart; but if all the secondary

and chief maxima are considered, there are indications of an 11-year period, thus:—

Mean dates of minima—  
 1814 ... 1825 ... 1836 ... 1847 ... 1858 ... 1869 ... 1880 ... 1891  
 Frost days, Paris—maxima—  
 1814 ... 1830 ... 1839 ... — ... 1856 ... — ... 1878 ... 1889  
 July temp. Paris, minima—  
 1815 ... 1830 ... 1842 ... — ... 1862 ... — ... 1881 ... 1890

In the *Annals* of the Astronomical Observatory of Harvard College, vol. xxxi. part I, p. 103, is given the average temperature for each five years, observed at a large number of stations in New England. The three stations having the longest records, namely, New Haven, Connecticut, Cambridge, Massachusetts, and New Bedford, Massachusetts, are given below:—

Year.	1781-85.	1786-90.	1791-95.	1796-00.	1801-05.	1806-10.	1811-15.	1816-20.	1821-25.	1826-30.	1831-35.
Cambridge			50.4	48.0	49.4	47.4					
New Bedford ...								48.1	49.5	49.6	48.2
New Haven	49.0	49.8	49.8	50.0	51.2	49.3	47.8	46.9	49.2	49.8	48.1

Year.	1836-40.	1841-45.	1846-50.	1851-55.	1856-60.	1861-65.	1866-70.	1871-75.	1876-80.	1881-85.	1886-90.
Cambridge		46.6	47.7	47.4	47.1	48.1	47.1	46.4	48.5	48.5	49.0
New Bedford ...	47.0	47.8	48.8	48.6	47.9	49.9	48.3	47.1	49.1	48.1	47.9
New Haven	47.5	49.4	49.1	48.6	48.9	50.6			51.7	48.4	48.6

These records show that maxima occurred in New England about 1803, 1828, 1848, 1863, 1876, and 1889, and minima about 1818, 1838, 1858, and 1873. If these are arranged according to intervals of 22 years, as before, the following results are obtained:—

Mean dates of  
 maxima ... 1803 ... 1825 ... 1847 ... 1869 ... 1891  
 Observed max. temp.  
 New England ... 1803 ... 1828 ... 1848 ... 1863 ... 1889  
 Minima ... 1818 ... 1838 ... 1858 ... 1873  
 Observed ... 1818 ... 1838 ... 1858 ... 1873

It will be seen that the dates of maximum and minimum temperature correspond almost exactly with those observed in Paris, showing how general were the forces acting to produce them.

That there exists all over the world a tendency to a period of

about 33 years, is so well worked out by Brückner, that it is only necessary to refer the reader to his treatise on "Klimaschwankungen seit 1700," to find exhaustive data on this subject.

This harmonic tendency of multiplication in weather periods has been extensively worked out by the writer in shorter periods, and the evidence of its existence appears conclusive, based in that case on a very large mass of data. It is desired to call attention to it here, that those making future inquiries concerning sun-spot periodicity and the weather may bear the possibility of this phenomenon in mind.

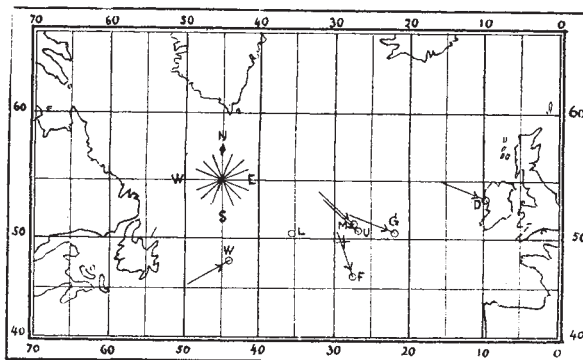
H. HELM CLAYTON.

Blue Hill Meteorological Observatory, Readville, Mass.

### Abnormal Atlantic Waves.

In 1887 (*NATURE*, vol. xxxvii. p. 151) you kindly published a few remarks from me on the possible volcanic origin of the two waves which swept the decks of the steamers *Umbria* and *Faraday*, and which, from the data then available, seemed to have originated at a point in the Atlantic known as the "Faraday Reel," and marked with a cross (+) on the accompanying chart. I am now able to send you the details of a few similar cases which I have collected since then. The exact positions of the vessels, and the directions from which these solitary waves seemed to come, being also marked on the chart. In the case of H.M.S. *Orontes* the ship's course was not stated, and on account of darkness and other causes the directions from which some of the other waves came are not to be depended upon. None of these encounters would have been reported had they not caused much damage—masts and funnels going by the board, and hulls, decks, and lifeboats being smashed; but many seafaring men can recall solitary and abnormally high waves having struck their vessels, although the sea was otherwise quiet. Amongst the strange results which these blows have produced, may be mentioned that the magnetism of the steamship *Energia* was thus suddenly altered sufficiently to introduce an error of 18° into the compass readings. The full details about this and a few other vessels have not been obtained.

North Atlantic.



Initial.	Ship's name.	Local time.	Date.	Latitude.		Longitude.	Speed.	Ship's course.]	Wave's course.
				North.		West.			
F	<i>Faraday</i> ... ..	6.45 a.m.	14/2/84	46 11		27 53	Knots. 6	N. 72° E.	Port beam.
W	<i>Westernland</i> ...	2.45 a.m.	27/11/86	47 59		43 57	7	S. 60° W.	Bow.
G	<i>Germanic</i> ... ..	9.40 a.m.	5/5/87	50 36		22 8	4	N. 68° W.	Bow.
U	<i>Umbria</i> ... ..	4.40 a.m.	26/7/87	50 50		27 8	16	S. nearly W.	3 points on starboard bow.
	H.M.S. <i>Orontes</i> ..	5 p.m.	18/2/91	36 12		32 50	9	?	Bow.
L	<i>Festina Lente</i> ...	noon.	16/11/94	50 12		35 23	?	S.E. by S.	?
M	<i>Manhattan</i> ... ..	2 a.m.	17/11/94	51 26		27 31	?	S. 86° W.	N.W.
D	<i>Diamond</i> ... ..	10 p.m.	21/11/94	53 9		9 52	Lying to	W.N.W.	W.N.W.