and under the management of Prof. Henry Draper, containing a report "on the chemical and physical facts collected from the Deep Sea Researches made during the voyage of the nautical school-ship *Mercury*, undertaken in the Tropical Atlantic and Caribbean Sea in 1870-71; the "cruisers" being, not Dr. Carpenter, Prof. Wyville Thomson, and Mr. Gwyn Jeffreys, but the boys committed to the care of the Commissioners in New York for slight misdemeanours and vagrancy!

WE regret to hear that the Geology Class at Christ's Hospital, having gone through an introductory course of lectures, has stopped, and has not been replaced by a class of Botany or any sister science. It is greatly to be regretted that the Chemistry Class do not get beyond the simpler metals and easy testing; those who would wish to study Chemistry are restricted to the more elementary branches of inorganic chemistry alone.

PROF. HUGHES, F.R.G.S., gave two lectures at Christ's Hospital on February 3 and 10 on Physical Geography. In his introduction he, like Prof. Huxley, claimed for his science a position equal to that held by the German Erdkunde, defining both to be that which explained to us "the aspect of nature and natural phenomena." In his first lecture he dealt with "High Lands and Table Lands," somewhat overthrowing the popular idea of mountains gained from text books. In his second lecture he spoke of the "Ocean and Deep-Sea Currents," explaining clearly and advocating warmly the ingenious theories and proofs of Dr. Carpenter, about which there has been so much discussion in the pages of NATURE. We attach no little importance to these lectures, because they brought the hearers up to the present state of our knowledge of the deep sea and of the Himalayan Mountains, far further than the best text-books have yet brought us. It is only to be regretted that other gentlemen of like abilities and knowledge with Prof. Hughes do not come forward and offer to lecture to boys on other branches of Natural Science. It is hard for those who feel an interest in nature to feel themselves bound by the iron chains of verse composition.

Lippincott's Magazine for January contains an interesting and profusely-illustrated article on the New Port Storm Signals, by Prof. Thompson B. Maury.

PHYSICS

Preliminary Catalogue of the Bright Lines in the Spectrum of the Chromosphere*

THE following list contains the bright lines which have been observed by the writer in the spectrum of the chromosphere within the past four weeks. It includes, however, only those which have been seen twice at least; a number observed on one occasion (Sept. 7) still await verification.

The spectroscope employed is the same described in the Journal of the Franklin Institute for November 1870; but certain important modifications have since been effected in the instrument. The telescope and collimator have each a focal length of nearly 10 inches, and an aperture of $\frac{7}{8}$ of an inch. The prism-train consists of five prisms (with refracting angles of 55°) and two half-prisms. The light is sent twice through the whole series by means of a prism of total reflection at the end of the train, so that the dispersive power is that of twelve prisms. The instrument distinctly divides the strong iron line at 1961 of Kirchhoff's scale, and separates B (not b) into its three components. Of course it easily shows everything that appears on the spectrum maps of Kirchhoff and Ångström. The adjustment for "the position of minimum deviation" is automatic; *i.e.*, the different portions of the spectrum are brought to the centre of the field of view by a movement which at the same time also adjusts the prisms.

* Reprinted from the *American Journal of Science and Arts.*

The telescope to which the spectroscope is attached is the new equatorial recently mounted in the observatory of the College by Alvan Clark and Sons. It is a very perfect specimen of the admirable optical workmanship of this celebrated firm, and has an aperture of $9\frac{4}{10}$ inches, with a focal length of 12 feet.

In the table the first column contains simply the reference number. An asterisk denotes that the line affected by it has no well-marked corresponding dark line in the ordinary solar spectrum.

The second column gives the position of the line upon the scale of Kirchhoff's map—determined by direct comparison with the map at the time of observation. In some cases an interrogation mark is appended, which signifies not that the existence of the line is doubtful, but only that its precise place could not be determined, either because it fell in a shading of fine lines, or because it could not be decided in the case of some close double lines which of the two components was the bright one; or, finally, because there were no well-marked dark lines near enough to furnish the basis of reference for a perfectly accurate determination.

The third column gives the position of the line upon Ångström's normal atlas of the solar spectrum. In this column an occasional interrogation mark denotes that there is some doubt as to the precise point of Ångström's scale corresponding to Kirchhoff's. There is considerable difference between the two maps, owing to the omission of many faint lines by Ångström, and the want of the fine gradations of shading observed by Kirchhoff, which renders the co-ordination of the two scales sometimes difficult, and makes the atlas of Kirchhoff far superior to the other for use in the observatory.

The numbers in the fourth column are intended to denote the percentage of frequency with which the corresponding lines are visible in my instrument. They are to be regarded as only roughly approximative; it would of course require a much longer period of observation to furnish results of this kind worthy of much confidence.

In the fifth column the numbers denote the relative brilliance of the lines on a scale where 100 is the brightest and 1 the faintest. These numbers also, like those in the preceding column, are entitled to very little weight.

Ref. No.	Kirchhoff.	Angstrom.	Relative Frequency.	Relative Brightness.	Chemical Element.	Previous Observer.
1	534·5	7060·?	60	3		
2	654·5	6677·?	8	4		L.
3	C	6561·8	100	100	H.	L. J.
4	719·0	6495·7	2	2	Ba.	
5	734·0	6454·5	2	3		
6	743·?	6431.	2	2		
7	768·?	6370·	2	2		
8	816·8	6260·3	1	1	Ti.	
9	820·0	6253·2	1	2	Fe.	
10	874·2	6140·5	6	8	Ba.	L.
11	D_1	5894·8	10	10	Na.	L.
12	D_2	5889·0	10	10	Na.	L.
*13	1017·0	5871·	100	75		L. J.
14	1274·3	5534·0	6	8	Ba.	R. L.
15	1281·5	5526·0	1	1	Fe.	
16	1343·5	5454·5	1	2	Fe.	
17	1351·3	5445·9	1	2	Fe. Ti.	
18	1363·1	5433·0	1	1	Fe.	
*19	1366·0	5430·0	2	3		
20	1372·0	5424·5	3	4	Ba.	L.
21	1378·5 ?	5418·0 ?	1	2	Ti. ?	
*22	1382·5	5412·	1	1		
23	1391·2	5403·0	2	2	Fe. Ti.	
24	1397·8	5396·2	1	2	Fe.	
25	1421·5	5370·4	1	2	Fe.	R.
26	1431·3	5360·6	2	2		R. ?
27	1454·7	5332·0	2	2	Ti.	
28	1462·9	5327·7	1	3	Fe.	
29	1463·4	5327·2	1	3	Fe.	
30	1465·0 ?	5321·	2	2		
31	Corona line 1474·1	5315·9	75	15	Fe?	L.

Ref. No.	Kirchhoff.	Angström.	Relative	Relative Brightness	Chemical Element.	Previous Observer.
32	1505·5	5283·	5	4		
33	1515 5	5275·0	7	5		L. R.
34	E_1	5269·5	1	3	Fe. Ca.	
35	E_2	5268·5	1	2	Fe.	
36	1528·0	5265·5	3	2	Fe. Co.	L.
37	1561·0	5239·0	1	1	Fe.	
38	1564·1	5236·2	1	1		
39	1567·7	5233·5	2	2	Mn.	R.
40	1569·7	5232·0	1	2	Fe.	
41	1577·3	5226·0	1	2	Fe.	
42	1580·5 ?	5224·5	1	1	Ti.	
43	1601·5	5207·3	3	3	Cr. Fe. ?	
44	1604·4	5205·3	3	3	Cr.	
45	1606·5	5203·7	3	3	Cr. Fe. ?	
46	1609·3	5201·6	1	2	Fe.	
47	1611.5	5199·5	1	1		
48	1615·6	5197·0	3	2		L. R.
49	b_1	5183·0	15	15	Mg.	L.
50	b_2	5172·0	15	15	Mg.	L.
51	b_3	5168·5	12	10	Ni.	L.
52	b_4	5166·5	10	10	Mg.	L.
53	1673·9	5153·2	1	1	Na.	
54	1678·0	5150·1	1	2	Fe.	
55	1778·5	5077·8	1	1	Fe.	
56	1866·8	5017·5	2	3		R.
57	1870·3	5015·?	2	2		R.
58	1989·5	4933·4	8	5	Ba.	L.
59	2001·5	4923·2	5	3	Fe.	R. L.
60	2003·2	4921·3	1	1		
61	2007·1	4918·1	3	3		L.
62	2031·0	4899·3	6	4	Ba.	L.
63	2051·5	4882·5	2	2		L.
64	F.	4860·6	100	75	H.	J. L.
65	2358·5	4629·0	1	1	Ti.	
66	2419·3	4583·5	1	1		
67	2435·5	4571·4	1	1	Li.	
68	2444·0	4564·6	1	1		
69	2446·6	4563·1	1	2	Ti.	
70	2457·8	4555·0	1	1	Ti.	
71	2461·2	4553·3	3	3	Ba.	
72	2467·7	4548·7	1	3	Ti.	
73	2486·8	4535·2	1	1	Ti. Ca. ?	
74	2489·5	4533·2	1	1	Fe.	
75	2490·6	4531·7	1	1	Ti.	
76	2502·5	4524·2	2	2	Ba.	
77	2505·8	4522·1	1	2	Ti.	
78	2537·3	4500·4	1	3	Ti.	
79	2553·?	4491·0 ?	1	1	Mn. ?	
80	2555·?	4489·5 ?	1	1	Mn. ?	
81	2566·5	4480·4	1	2	Mg.	L.
82	2581·5 ?	4471·4	75	8	A band rather than a line.	
83	2585·5	4468·6	1	1	Ti.	
84	2625·0	4443·0	1	1	Ti.	
85	2670·0	4414·6	1	1	Fe. Mn.	
86	2686·7	4404·3	1	2	Fe.	
87	2705·0	4393·5	3	2	Ti.	
88	2719·?	4384·8	1	1	Ca. ?	
89	2721·2	4382·7	1	2	Fe.	
90	2734·?	4372·	1	1		
91	2737·?	4369·3 ?	1	1	Cr.	
92	2775 8	4352·0	1	1	Fe. Cr.	
93	2796·0	4340·0	100	50	H.	L. J.
94	G.	4307·0	1	2	Fe. Ti. Ca.	
95	2870·0	4300·0	1	1	Ti.	
96		4297·5	1	1	Ti. Ca.	
97		4289·0	1	2	Cr.	
98		4274·5	1	2	Cr.	
99		4260·0	1	1	Fe.	
100		4245·2	1	1	Fe.	
101		4226·5	1	1	Ca.	
102		4215·5	1	2	Fe. Ca.	
103	*h.*	4101·2	100	20	H.	R. L.

The sixth column contains the symbols of the chemical substances to which, according to the maps above referred to, the lines owe their origin.

There are no disagreements between the two authorities; in a majority of cases, however, Angström alone indicates the element, and there are several instances where the lines of more than one substance coincide with each other and with a line of the solar spectrum so closely as to make it impossible to decide between them.

In the seventh and last column the letters J., L., and R. denote that to my knowledge the line indicated has been observed and its place published by Janssen, Lockyer, or Rayet. It is altogether probable that a large portion of the other lines contained in the catalogue have before this been seen and located by one or the other of these keen and active observers, but if so I have as yet seen no account of such determinations.

I would call especial attention to the lines numbered 1 and 82 in the catalogue; they are very persistently present, though faint, and can be distinctly seen in the spectroscope to belong to the chromosphere as such, not being due, like most of the other lines, to the exceptional elevation of matter to heights where it does not properly belong. It would seem very probable that both these lines are due to the same substance which causes the D^3 line.

I do not know that the presence of titanium vapour in the prominences and chromosphere has before been ascertained. It comes out very clearly from the catalogue, as no less than 20 of the whole 103 lines are due to this metal.

Hanover, N.H., Sept 13, 1871 C. A. YOUNG

SCIENTIFIC SERIALS

THE *American Naturalist* for October 1871 commences with a paper by Dr. Jeffreys Wyman entitled, "Experiments with Vibrating Cilia," the chief points in which are some determinations of the rate of movement of the vibrating cilia on the gills of Mollusca, both in air and in water, and the description and drawing of an instrument by means of which this rapidity can be measured and exhibited so as to be seen over a large lecture-room. Prof. James Orton furnishes some contributions to the Natural History of the Valley of Quito (continued in the next number); and Dr. J. S. Billings contributes a paper on *Hysterium*, a genus of Ascomycetous Fungi, and some of its allies, illustrated by a plate. Mr. T. Martin Trippe has a very interesting paper on some differences between Eastern and Western Birds, in which he traces the difference in habits, note, time of breeding, &c., in the same species of bird in the eastern and newly-settled western portions of the American continent, and the manner in which the indigenous avifauna of the Western States is becoming gradually superseded by eastern forms, along with the advance of man.

The first paper in the number for November is by Grace Anna Lewis on Symmetrical Figures in Birds' Feathers, in illustration of the beauties furnished for the microscope by the feathers of birds. Dr. Elliott Coues gives a description and drawing of a little-known species of oriole, the only one which is a native of the Western States, and is known as Bullock's Oriole, *Xanthorthus Bullochii*, Swainson. Prof. George H. Perkins contributes some "Notes on the Geodes of Illinois;" and the remainder of the number is occupied by reviews, and the usual interesting items of Natural History Miscellany.

The number for December opens with an extremely interesting paper by the Editors on "The Mammoth Cave and its Inhabitants," an account of a visit paid to this extraordinary cavern in a hill of the sub-carboniferous limestone formation in Edmondson County, Kentucky, after the Indianapolis meeting of the American Association for the Advancement of Science. After a general description of the cave and history of its inhabitants, it contains a description, with drawings, of all the species of Crustacea and insects which are found in it. The Rev. Samuel Lockwood writes an account of "A Singing *Hesperomys* or Vesper-mouse," the species known as the jumping-mouse, wood-mouse, and white-footed mouse, with the notes of its song. This number concludes Vol. v. of this admirably-conducted magazine, which we commend to the notice of all interested in the study of natural history.

Journal of Botany for January. A memoir of the late lamented editor of this journal, Dr. Berthold Seemann, commences the new