and its properties since 1875, when the first edition was published, have been taken into account. The work now consists of four parts. The first part deals with timber in general; in part ii. the timbers of Dicotyledonous trees are considered; part iii. deals with Coniferous timber trees; and the fourth part chiefly consists of tables showing the results of experimental investigations on the physical properties of timber. The book has been of valuable service to the shipwright and carpenter from the time it first appeared; and Prof. Ward's revision has certainly given it a new lease of life.

THE appearance of a second edition of Lord Rayleigh's "Theory of Sound" (Macmillan and Co.) reminds us that the first edition was reviewed in these columns by that eminent investigator, Hermann von Helmholtz, nearly seventeen years ago. Much additional matter has been included in the new edition, and the subject is carried to the limits of the present state of knowledge. Two new chapters have been interpolated, devoted to curved plates or shells, and to electrical vibrations. It was the author's original endeavour to produce "a connected exposition of the theory of sound, which should include the most important of the advances made in modern times by mathematicians and physicists." This object has been borne in mind in the preparation of the new edition. Lord Rayleigh naturally inclines to physical methods of investigation, but purely mathematical solutions are not entirely eschewed. The work has been recognised as a masterly exposition of a difficult subject ever since it first appeared, and the second edition maintains the high standard of the original.

AN important memoir concerning nitrogen trioxide, nitrous anhydride, N_2O_3, is communicated by Prof. Lunge and Herr Porschnew to the current issue of the *Zeitschrift für Anorganische Chemie*. It is claimed that the investigation, whose results are now published, finally disposes of all doubt as to the existence of this much discussed oxide of nitrogen. The main conclusion derived from the work is that nitrogen trioxide is a well characterised individual substance, which is readily formed under ordinary atmospheric pressure below the temperature of $-21°$ by the union of nitric oxide NO and nitrogen peroxide N_2O_4, and constitutes an indigo-blue liquid. It is stated to be perfectly stable at and below this temperature; but at a temperature slightly superior to this, even under pressure, it commences to decompose, and the dissociation is almost complete upon the conversion of the liquid into gas. Nitrous anhydride in a condition of purity thus appears to be incapable of existence in the gaseous state, while forming a comparatively stable liquid at temperatures below $-21°$. The gaseous product of dissociation, a mixture of nitric oxide and peroxide, exhibits similar chemical properties to those which might have been expected of gaseous nitrogen trioxide, hence of course the difficulty which has been experienced in deciding the question. It is pointed out, however, that the absolute incapability of existence of gaseous molecules of nitrogen trioxide is not proved, and the results of the investigation would appear to indicate that a residue of such molecules does escape dissociation upon the passage of the liquid into the gaseous state, and exists side by side with the molecules of the decomposition products. The experiments upon which these conclusions are based are mainly the following. It was first established that nitric oxide and nitrogen peroxide exhibit only the very slightest inclination to unite chemically at the ordinary temperature and at temperatures up to 100°. It was next found that at the temperature of $-21°$ the two oxides combined in practically exactly molecular proportions to form the indigo-blue liquid. The exact amount of N_2O_3 present in one of the specimens analysed is stated to have been 98·3 per cent. The well known work of Ramsay and Cundall upon this subject is, of course, quoted, and it is stated that the apparently small amount of absorption of nitric oxide by liquid nitrogen peroxide, corresponding to only 3·5 per cent. of N_2O_3, observed during that investigation, was due to the loss of weight by mechanical removal of a portion of the nitrogen peroxide in the stream of issuing nitric oxide. It was further demonstrated that the product of the action of oxygen upon nitric oxide gas behaves, particularly towards sulphuric acid, precisely like a mixture, which it probably is, of nitric oxide and nitrogen peroxide. Moreover, the vapour derived from liquid nitrogen trioxide is not stable towards oxygen, but becomes further oxidised until it is almost pure peroxide. The memoir will be found to include an admirable summary of the literature of the subject, together with the views of Prof. Lunge concerning the bearing of the main conclusions of the investigation upon the theory of the sulphuric acid manufacture.

THE additions to the Zoological Society's Gardens during the past week include a Vervet Monkey (*Cercopithecus lalandii*) from South Africa, presented by Mr. Seymour Willoughby; a Pig-tailed Monkey (*Macacus nemestrinus*) from Java, presented by Mr. H. M. Vincent; a Tiger (*Felis tigris*) from Amoy, China, presented by Mr. Robert Bruce; a Tiger Cub (*Felis tigris*) from Burmah, presented by Mr. John Halliday; a Ring-tailed Coati (*Nasua rufa*) from South America, presented by Mr. J. E. Symonds; two Brazillian Caracaras (*Polyborus brasiliensis*) from South America, presented by Lord Lilford; two Grey-breasted Parrakeets (*Bolborhynchus monachus*) from Monte Video, presented by the Inns of Court Hotel Company; an Egyptian Jerboa (*Dipus ægyptius*) from Egypt, a Patagonian Conure (*Conurus patagonus*) from La Plata, two Brazilian Cariamas (*Cariama cristata*) from South-east Brazil, deposited.

OUR ASTRONOMICAL COLUMN.

TRIANGULATION OF SIXTEEN STARS IN THE PLEIADES.—In addition to the great interest that has always been attached to this bright group of stars, the Pleiades, as can be gathered from the numerous myths (NATURE, vol. xlix. p. 366) which have been handed down to us, their value to the practical astronomer has been by no means small. In most astronomical measurements, observations have first to be made on stars the positions of which are accurately known, in order to determine the instrumental constants: thus, for instance, the pitch of micrometer screws, ring micrometer constants, &c. The Pleiades, as they consisted of a group of bright stars suitable for such determinations, were constantly used for these purposes, and this necessitated a previous complete knowledge of their positions and motions.

At the present day, however, the stars in the Pleiades group are rather of too bright a nature and too varied in magnitude for very accurate determinations of instrumental constants, and the tendency is now to turn to that group of stars in Perseus, which is more suitable in many respects. A recent triangulation of this region has lately been undertaken by Prof. Wilhelm Schur at Göttingen, with the large heliometer, the results of which appeared in the *Proceedings of the Royal Society of Sciences of Göttingen*. The triangulation to which we wish to refer is of sixteen stars in the Pleiades, and has been made by Dr. Leopold Ambronn at the Göttingen Observatory (*Astronomische Mittheilungen von der Königlichen Sternewarte zu Göttingen*, Bd. xxxix. 3 part).

The instrument employed, a good illustration of which is given, was the small Fraunhofer heliometer, which in earlier times was used in the two Venus Expeditions of this century. It might at first sight seem superfluous to attempt this triangulation with such a small instrument, when we are already acquainted with the results obtained from larger heliometers.

The value of this investigation lies, however, in the very minute determinations of the instrumental constants, and these would be interesting even if nothing more were attempted.

Dr. Ambronn has, however, after making these instrumental constant determinations, measured the positions of sixteen of the Pleiades stars, and compared them with the results obtained

from Elkin's new computed values of Bessel's measures made with the Konigsberg heliometer. The following table is of interest, as it brings out the great accuracy of the Göttingen observations, and leads to suggestions regarding the grouping of the stars in numerous systems.

Stars.	Göttingen.—Königsberg.		Relative proper motion for 50 years in	
	R.A.	Decl.	Magnitude.	Direction.
	″	″	″	°
g	+0 06	+0·09	0·13	29·0
b	+0·20	+0·42	0·46	23·2
m	−0·66	−0·18	0·63	253·3
e	+0·49	+0·12	0·47	75·1
c	+0·52	+0·07	0·49	81·1
k	+0·01	+0·13	0·14	4·4
l	+0·09	+0·16	0·18	26·6
d	−0·35	−0·06	0·33	259·5
12	−0·60	−0·01	0·55	268·9
η	—	—	—	—
28	+0·12	+0·22	0·25	26 6
s	+1·30	−0·76	1 42	122·5
f	−0·04	−0·16	0·17	194·1
h	+0·04	+0·03	0·05	53·1
34	+0·60	+0·23	0·60	67·3
40	+0·44	+0·50	0·64	38·7

Dr. Ambronn points out that the proper motions appear to show, just as those of Elkin's indicated, that the stars form not one but several systems. As will be seen from the table, *g*, *b*, *k*, *l* (and 28) appear to group themselves together, so also *e* with *c*, and the three stars *m*, *d*, 12, with one another. For a more definite opinion on this point it is suggested that the number of stars observed must be greatly increased.

The result of the triangulation shows, however, that by a suitable determination of the instrumental constants and due care in arranging the measures for reduction, small heliometers can give results, especially with regard to distances, which compare very favourably with instruments of much larger size.

THE FIFTH SATELLITE OF JUPITER.—A series of micrometrical measures of the fifth satellite of Jupiter, made during the opposition of the planet in 1893, is contributed to the *Astronomical Journal*, No. 325, by Prof. E. E. Barnard. From numerous observations, Prof. Barnard is confident that the satellite is not brighter than the thirteenth magnitude. Its sidereal period appears to be 11h. 57m. 22·618s. Filar-micrometer measures of the diameters of Jupiter were made in the course of the work, the following values being obtained :—

Equatorial diameter ... ... 90,190 ± 56 miles.
Polar diameter ... ... 84,570 ± 75 miles.

The polar compression obtained from these measures is 1/15·98. The mean of measures of east elongations of the satellite, made from September 1893 to January 1894, correspond to a distance of 111,910 miles. But on account of the eccentricity and revolution of the orbit of the satellite, the elongation distance is a varying quantity. M. Tisserand was led to conclude, a short time ago, that the major axis of the satellite's orbit must make a complete revolution in about five months. He returns to the subject in *Comptes-rendus* for October 8, having used Prof. Barnard's new measures to make another determination of the eccentricity and the longitude of perijove at a given epoch. His discussion of the observations has led to the following results :—Semi-major axis, 47″·906; eccentricity, 0·0073; longitude of perijove at the epoch October 28, 1892, − 14°.

THE PAST SUMMER.

AN examination of the meteorological results for the six months from April to September exhibit some features of interest by way of showing how the several elements of temperature, rainfall, and sunshine combine to make up what is commonly called weather, and how, as in the case of the summer in question, the absence of sunshine can mar the season. In some summers the character of the weather varies considerably in different parts of the kingdom, but during the recent summer there was a great similarity in the conditions over the whole of the British Islands, and consequently the principal facts in the following summary, deduced from observations in the neighbourhood of London, will, to a great extent, be an index for other parts of the kingdom.

Table showing the Temperatures at Greenwich for the several Months and for the whole Summer.

	Mean.	Diff. from average.	Mean of all highest.	Diff. from average.	Mean of all lowest.	Diff. from average.	Warm days.	Cold days.
	°	°	°	°	°	°		
April ...	51·9	+3·8	61·8	+4·6	41·9	+3·0	26	4
May ...	51·8	−2·1	61·1	−3·1	42·5	−1·2	10	21
June ...	59·8	−0·6	69·2	−1·7	50·4	+0·5	11	19
July ...	63·6	0·0	73·0	−1·0	54·1	+1·0	13	18
August..	61·4	−1·5	69·2	−3·6	53·6	+0·6	5	26
Sept. ...	55·2	−3·0	62·2	−5·1	48·1	−1·0	6	24
Summer	57·3	−0·6	66·1	−1·6	48·4	+0·4	71	112

The averages used in the above comparison are for the 50 years 1841 to 1890. A warm day is one on which the mean daily temperature is above the average, and a cold day is one on which the mean daily temperature is below the average.

It will be noticed that the mean maximum temperature is below the average, except in April; while the mean minimum temperature is in excess of the average, except in May and September. The highest day temperatures at Greenwich only reached 70° or above on 51 days, and they were distributed as follows throughout the summer :—April, 3 days; May, 2; June, 12; July, 21; August, 12; and September, 1. There were in all only 7 days with a temperature of 80° or above; they occurred as follows :—June, 3; July, 3; and August 1. For the last 50 years, 1845-1894, there have been on the average 75 days with a temperature of 70° and above, and 15 days with a temperature of 80° and above. The summers of 1860, 1879, and 1888 each had a fewer number of hot days than the summer which has just passed, while 1846, 1857, 1858, 1865, 1868, and 1893 each had double the number of hot days. Last year the mean temperature for the whole summer was more than 3° in excess of the mean for the summer this year, but the summer last year was warmer than any during the last half-century, although it was only 0°·2 warmer than in 1868.

The following table gives the rainfall and sunshine at Greenwich, and the sunshine values at Westminster, for the several months and for the whole summer :—

	Rainfall.			Hours of bright sunshine.			Sunless days.
	Rainy days.	Total amount.	Diff. from average of 40 years.	Greenwich.	Westminster.	Diff. from average of 10 years.	
		ins.	ins.				
April	14	1·45	− 0·21	123	122	− 2	4
May	15	1·53	− 0·54	137	152	− 32	2
June	11	2·02	− 0·03	127	155	− 19	2
July	19	3·27	+ 0·87	149	166	− 9	2
August	16	3·04	+ 0·55	114	125	− 39	4
September ...	13	1·27	− 0·98	60	83	− 29	9
Summer	88	12·58	− 0·34	710	803	− 130	23

The above figures show that rain fell with great frequency, but the amount was by no means excessive, and, with the exception of July and August, the monthly falls were below the average. A slightly different result is obtained if the comparison is made with the last 50 years, 1845 to 1894, the average total fall in summer for that period being 12·66 inches, which gives a deficiency of 0·08 inch only for the recent