MESSRS. D. C. HEATH AND CO. (Boston) will publish at once Compayre's "Lectures on Pedagogy: Theoretical and Practical," a companion volume to their Compayre's "History of Pedagogy." It is translated and annotated by Prof. Payne, of the University of Michigan.

PROF. J. VIOLLE has just issued the first part of the second volume of his "Cours de Physique." The present part relates to acoustics.

WE reprint from *Science* of June 1, 1888, the following suggestive paragraph:—"The Committee of the House of Representatives on acoustics and ventilation has actually reported favourably a Bill appropriating seventy-five thousand dollars to subsidize a man who thinks he can construct a steel 'vacuum' balloon of great power. He is to be allowed to use the facilities of one of the navy-yards for the building of his machine, and is to have the money as soon as he has expended seventy-five thousand dollars of private capital upon his air-ship. One of the mathematical physicists of Washington was asked by a member of Congress whether such a balloon could be successfully floated. He set to work upon the problem, and here are some of his results, which are rather curious:—A common balloon is filled with hydrogen gas, which, being lighter than air, causes the balloon to rise and take up a load with it. But, as the pressure of the gas within is equal to the pressure of the atmosphere without, no provision other than a moderately strong silk bag is required to prevent collapse. The inventor of the proposed steel balloon hopes to gain greater lifting-power by using a vacuum instead of gas, the absence of substance of any kind being lighter than even hydrogen gas. But he has to contend with the tendency of the shell to collapse from the enormous pressure of the atmosphere on the outside, which would not be counterbalanced by anything inside of it. The first question which presented itself was, How thick could the metal of the shell be made, so that the buoyancy of the sphere, which would be the most economical and the strongest form in which it could be constructed, would just float it without lifting any load? The computations showed that the thickness of the metal might be '000055 of the radius of the shell. For example: if the spherical shell was one hundred feet in diameter, the thickness of the metal composing it could not be more than than one-thirtieth of an inch, provided it had no braces. If it was thicker, it would be too heavy to float. Now, if it had no tendency to buckle, which of course it would, the strength of the steel would have to be equivalent to a resistance of more than 130,000 pounds to a square inch to resist absolute crushing from the pressure of the air on a cross-section of the metal. Steel of such high crushing-strength is not ductile, and cannot be made into such a shell. If the balloon is to be braced inside, as the inventor suggests, just as much metal as would be used in constructing the braces would have to be subtracted from the thickness of that composing the shell. Of course, such a shell would buckle long before the thickness of the metal of which it was composed was reduced to '000055 of its radius. In other words, it is mathematically demonstrated that no steel vacuum balloon could be constructed which could raise even its own weight. This is an illustration of how intelligently Congress would be likely to legislate on scientific matters unguided by intelligent scientific advice."

THE additions to the Zoological Society's Gardens during the past week include two Pig-tailed Monkeys (*Macacus nemestrinus* ♂ ♀) from Java, presented by Mr. C. W. Ellacott; a Bonnet Monkey (*Macacus sinicus* ♀) from India, presented by Mr. J. Wiltshire; a Pig-tailed Monkey (*Macacus nemestrinus*) from Java, presented by Mrs. Gleig; two Spotted Cavys (*Cælogenys paca* ♂ ♀) from South America, presented by Mr. W. H. Stather; a Mauge's Dasyure (*Dasyurus maugæi*) from Australia, presented by Mr. H. R. Brame; three Abyssinian Sheep (*Ovis aries*, var.) from Abyssinia, presented by Mr. A. J. Baker; two Pallas's Sand Grouse (*Syrrhaptes paradoxus*) from the Island of Tiree, Argyllshire, presented by Lieut.-Colonel Irby and Captain Savile Reid, F.Z.S.; a Wapiti Deer (*Cervus canadensis* ♂), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE CONSTANT OF ABERRATION.—In the year 1862, Prof. J. S. Hubbard commenced a series of observations of α Lyræ with the prime vertical instrument of the Washington Naval Observatory, which was continued by either Profs. Newcomb, Harkness, or Hall until 1867. The purpose of these observations had been to obtain corrections to the assumed values of the constants of nutation and aberration, and to afford an absolute determination of the annual parallax of the star. The series was not continued for a sufficient period for the first purpose; and Prof. Asaph Hall, when engaged on the determination of the parallax of α Lyræ by another method, found that these observations would give it a small negative value. From this and other circumstances he was at that time induced to think the observations would not repay the trouble of a careful discussion; but recently, reflecting that they had been skilfully designed, and carried out with care, he resolved to ascertain the result they would furnish for the constant of aberration. The observations commenced 1862 March 25, and extended to 1867 April 25, and were 436 in number. The mean resulting value of the parallax is—

$$\pi = -0''\cdot079 \pm 0''\cdot0134,$$

whilst

$$\text{Constant of aberration} = 20''\cdot4506 \pm 0''\cdot0142,$$

with an average probable error for a single observation of $\pm 0''\cdot174$.

Adopting a parallax of $+0''\cdot15$, the result would be—

$$\text{Constant of aberration} = 20''\cdot4542 \pm 0''\cdot0144.$$

Prof. Hall prefers this latter result, notwithstanding the uncertainty as to the true parallax of the star. The negative result obtained for the parallax may probably be due to the fact that the coefficient of parallax obtains its extreme values in January and July, when the mean temperature is likewise at its extreme points; the January observations also are made in daylight, but the July at night, which would tend to produce a systematic difference in the method of observing. The coefficient of aberration, on the other hand, has its greatest values in April and October, when the conditions of observation will be nearly the same.

The above value of the constant of aberration gives, for the solar parallax—

$$\pi = 8''\cdot810 \pm 0''\cdot0062,$$

Hansen's values of the mean anomaly of the earth, and eccentricity of its orbit being assumed, together with Clarke's value for the equatorial radius, and Michelson and Newcomb's determination of the velocity of light, viz. 186,325 miles per second.

THE MARKINGS ON MARS.—The observations of M. Perrotin at Nice, and M. Terby at Louvain, and, in England, of Mr. Denning at Bristol, have confirmed the presence on the planet of most of the "canals" or narrow dark lines which were discovered by M. Schiaparelli in 1877, and at subsequent oppositions. M. Perrotin has also been able to detect, in several cases, the gemination or doubling of the canals, and M. Terby has observed the same phenomenon in one or two cases, but with much greater difficulty than in the opposition of 1881-82. But some curious changes of appearance have been noted. An entire district (Schiaparelli's *Lybia*) has been merged in the adjoining "sea," *i.e.* its colour has changed from the reddish hue of the Martial "continents" to the sombre tint of the "seas." The district in question is larger than France. To the north of this district a new canal has become visible, and again another new canal has appeared to traverse the white North Polar cap, or, according to M. Terby, to divide the true Polar cap from a white spot of similar appearance a little to the south of it. With the exception of these changes, the principal markings, both light and dark, are those which former oppositions have rendered familiar.

COMET 1888 *a* (SAWERTHAL).—The following ephemeris for Berlin midnight is by Herr Berberich (*Astr. Nach.*, No. 2838), from elliptic elements which he has found for it, and which closely resemble those of Prof. Boss given in NATURE of May 24 (p. 88) :—

1888.	R.A. h. m. s.	Decl. °	Log *r*.	Log Δ.	Brightness.
June 23...	0 55 11 ...	46 11·5 N. ...	0·2760 ...	0·3129 ...	0·042
25...	0 57 1 ...	46 40·5			
27...	0 58 42 ...	47 8·9 ...	0·2887 ...	0·3173 ...	0·039
29...	1 0 16 ...	47 36·6			
July 1...	1 1 42 ...	48 3·7 ...	0·3009 ...	0·3212 ...	0·036
3...	1 3 0 ...	48 30·2			
5...	1 4 9 ...	48 56·0 ...	0·3127 ...	0·3247 ...	0·033
7...	1 5 9 ...	49 21·2			
9...	1 6 1 ...	49 45·7 ...	0·3241 ...	0·3278 ...	0·031
11...	1 6 44 ...	50 9·6			
13...	1 7 18 ...	50 32·8 N. ...	0·3352 ...	0·3306 ...	0·029

The brightness at discovery is taken as unity.

THE Kazan Observatory has celebrated its "Jubilee" by publishing an interesting report about its activity since it was founded by Littrow fifty years ago. The mapping of the stars between 75° and 80°, which was begun by Prof. Kovalsky, was continued and extended by his successor, Prof. Dubyago.

THE Tashkend Observatory has just issued the second volume of its "Works."

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 JUNE 24–30.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on June 24

Sun rises, 3h. 46m. ; souths, 12h. 2m. 13·7s. ; sets, 20h. 19m. : right asc. on meridian, 6h. 14·5m. ; decl. 23° 25′ N. Sidereal Time at Sunset, 14h. 33m.

Moon (Full, June 23, 21h.) rises, 19h. 57m.* ; souths, 0h. 9m. ; sets, 4h. 20m. : right asc. on meridian, 18h. 19·6m. ; decl. 21° 5′ S.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Right asc. and declination on meridian. h. m.	° ′
Mercury..	5 33 ...	13 25 ...	21 17 ...	7 37·2 ...	19 52 N.
Venus.....	3 23 ...	11 41 ...	19 59 ...	5 53·7 ...	23 36 N.
Mars.....	13 28 ...	18 53 ...	0 18*...	13 6·5 ...	7 39 S.
Jupiter....	17 6 ...	21 29 ...	1 52*...	15 42·7 ...	18 47 S.
Saturn....	6 29 ...	14 19 ...	22 9 ...	8 31·3 ...	19 34 N.
Uranus ...	12 56 ...	18 36 ...	0 16*...	12 49·3 ...	4 35 S.
Neptune..	1 59 ...	9 45 ...	17 31 ...	3 56·9 ...	18 47 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Comet Sawerthal.

June.	h.	Right Ascension. h. m.	Declination. ° ′
24 ...	0 ...	0 55·2 ...	46 12 N.
28 ...	0 ...	0 58·7 ...	47 9

Occultations of Stars by the Moon (visible at Greenwich).

June.	Star.	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image. ° °
24 ...	50 Sagittarii	... 6 ...	22 6 ...	23 16 ...	65 250
28 ...	50 Aquarii	... 6 ...	2 28 ...	2 59 ...	163 215

June.	h.	
25 ...	9 ...	Mercury stationary.
27 ...	23 ...	Mercury at greatest distance from the Sun.

Meteor-Showers.

	R.A.	Decl.	
Near 52 Herculis ...	... 253° ...	47° N. ...	June 25–30. Swift.
,, δ Cygni ...	... 295 ...	40 N. ...	Slow.
,, ϵ Delphini ...	... 305 ...	9 N. ...	June 28.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.	
U Cephei	0 52·4 ...	81 16 N. ...	June 25,	22 54	*m*
			,, 30,	22 33	*m*
R Geminorum ...	7 0·6 ...	22 53 N. ...	,, 27,		*M*
δ Libræ	14 55·0 ...	8 4 S. ...	,, 29,	2 2	*m*
U Ophiuchi... ...	17 10·9 ...	1 20 N. ...	,, 28,	2 52	*m*
			,, 28,	23 0	*m*
W Sagittarii ...	17 57·9 ...	29 35 S. ...	,, 24,	2 0	*m*
T Herculis	18 4·9 ...	31 0 N. ...	,, 27,		*M*
U Sagittarii... ...	18 25·3 ...	19 12 S. ...	,, 30,	2 0	*m*
β Lyræ...	18 46·0 ...	33 14 N. ...	,, 28,	22 0	*m*
S Vulpeculæ ...	19 43·6 ...	27 1 N. ...	,, 26,		*M*
η Aquilæ	19 46·8 ...	0 43 N. ...	,, 24,	21 0	*m*
R Sagittæ	20 9·0 ...	16 23 N. ...	,, 27,		*m*
X Cygni	20 39·0 ...	35 11 N. ...	,, 26,	22 0	*M*
δ Cephei	22 25·0 ...	57 51 N. ...	,, 27,	21 0	*M*

M signifies maximum ; *m* minimum.

GEOGRAPHICAL NOTES.

LIEUTENANTS KUND AND TAPPENBECK have been conducting an expedition into the Cameroons interior during the latter part of 1887 and the beginning of the present year. Starting from Batanga they succeeded in penetrating as far as 12° 30′ W. long., when, being attacked by Soudan Negro traders they were forced to retreat, both of them seriously wounded. They succeeded in tracing the course of the Beundo or Njong River far into the interior, and brought back much information concerning the people and the products of the country. With regard to general results, they found that the water-parting between the rivers that discharge in the Cameroons region and those that flow into the Congo Basin lies not near the coast as has hitherto been supposed, and therefore it is hoped that a navigable route may be discovered that will lead well into the interior. The water-parting between the left tributaries of the Binué and the rivers in the German Cameroons also lies far in the interior. The division between the Soudan Negroes and the Bantus is not to be looked for in the direction of Adamawa, but southwards is formed by the Zannaga River and eastwards lies at a distance of 150 miles from the coast. Lieutenants Kund and Tappenbeck assert that the area of Mohammedan influence extends much farther south than has hitherto been thought. No signs of volcanic action have been met with as far as the Zannaga River or in the mountains to the north. The profile which accompanies the report shows a coast plain about 70 feet high, succeeded by a sharp slope rising to a height of from 3000 to 4000 feet, beyond which the country slopes gradually to the inner African plateau, about 2500 feet above the sea.

THE June number of Petermann's *Mitteilungen* is mostly occupied with a memoir by Dr. Supan on "A Century of African Exploration," written in commemoration of the centenary of the British African Association, founded in June 1788. Dr. Supan traces the gradual opening up of the continent and its various regions, the text being illustrated by a series of most instructive maps. In indicating what yet remains to be done, Dr. Supan maintains that it is a mistake to assert that the days of pioneer exploration are over. He shows that while a few patches have been surveyed with some care, while of others we have a general knowledge, and while in other regions lines of travel have been run through, there are great regions that still remain absolutely blank. In the north, in the region of the Sahara, which has been so long known to Europe, the blanks are almost greater than elsewhere, leaving ample room for pioneer work, which may very well be carried on alongside of more minute exploration.

TECHNICAL INSTRUCTION.[1]

IN celebrating as we are now doing the fifty-first annual meeting of the Yorkshire Union of Institutes, one's thoughts naturally revert to the foundation of that Union and to the educational progress which our country has made since the earlier years of the century ; and round these thoughts will gravitate recollections of the life and labours of your revered President,

[1] Address delivered by Sir Henry Roscoe, M.P., F.R.S., at Castleford, on Wednesday, June 20, on the occasion of the fifty-first annual meeting of the Yorkshire Union of Mechanics' Institutes.