LIKE the authorities of the National Museum, Washington, the Curators of the Museum of the Academy of Natural Sciences, Philadelphia, complain that they have not nearly room enough for the display of the collections intrusted to their charge. "It is well within the truth," they state in their Report for 1886, "to say that the existing collections, if properly displayed, would completely fill a building of twice the dimensions of the present one. The large and very valuable collections of the Pennsylvania Geological Survey, contained in upwards of 200 cases, still remain in the cellar, boxed, for want of exhibition space. The types of the greater number of the fossil plants described by Lesquereux in his 'Coal Flora of the United States,' probably one of the most valuable collections of fossil plants in the world, have been added to this collection during the year, but, for similar reasons, still remain boxed. The report of the Professor of Ethnology and Archæology indicates that accessions to this department of the Academy's Museum could readily be had were proper exhibition space provided, but that under present conditions the same is impossible. In view of these facts the necessity for an extension to the Academy's building cannot be too strongly insisted upon." The Curators also urge that a fund should be raised for zoogeographical exploration. The interest derived from 50,000 dollars would, they think, fairly equip an annual expedition to any of the largely-unexplored regions lying about the dominions of the United States, such as Mexico, Central America, the Bahamas, and Labrador.

MR. ARTHUR J. BETHELL has reprinted, with additions and corrections, three articles which lately appeared in the *Field*, on a ride to the Falls of Zambesi. He has added a number of notes which may be of considerable service to men who think of spending some time in hunting in South Africa.

IT was decided some time ago that a number of the Crown diamonds of France should be sold. Others were put aside for the collections of the Paris School of Mines and Museum of Natural History; and these gems were recently given to the delegates appointed by the two Schools. The Regent diamond, a very fine one, will be kept in the Louvre Gallery.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus*), a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Miss E. James; a Three-striped Paradoxure (*Paradoxurus trivirgatus*) from India, presented by Mr. Gerald Callinder; a Common Squirrel (*Sciurus vulgaris*), British, presented by Miss May Honrott; a Scop's Owl (*Scops qui*), captured at sea near Aden, presented by Mr. W. M. Holland; a White-fronted Heron (*Ardea novæ-hollandiæ*) from Australia, presented by Mr. J. B. Dyas; a Stanley Parrakeet (*Platycercus icterotis*) from West Australia, a Burmeister's Cariama (*Chunga burmeisteri*) from South-East Brazil, a Black Sternothere (*Sternothærus niger*) from West Africa, received in exchange; two Smews (*Mergus albellus* ♂ ♀), European, purchased.

OUR ASTRONOMICAL COLUMN

COMET 1887 *b* (BROOKS, JANUARY 22).—The following ephemeris for this object is by Dr. R. Spitaler (*Astr. Nach.* No. 2773).

1887 Berlin midnight		R.A. h. m. s.		Decl. ° ′		Brightness
March 4	...	3 37 51	...	51 48·5 N.	...	1·19
6	...	3 43 32	...	49 39·6	...	1·15
8	...	3 46 11	...	47 35·1	...	1·12
10	...	3 53 33	...	45 35·2	...	1·08
12	...	3 58 3	...	43 39·9	...	1·04
14	...	4 2 17	...	41 49·3 N.	...	1·00

The brightness on January 25 is taken as unity.

COMET 1887 *c* (BARNARD, JANUARY 23).—Dr. H. Oppenheim gives (*Astr. Nach.* No. 2773) the following ephemeris for Berlin midnight for this comet:—

1887	R.A. h. m. s.	Decl. ° ′	log *r*	log Δ	Brightness
March 10	21 36 44	51 59·4 N.	0·3182	0·3700	0·6
14	21 52 56	53 51·0	0·3259	0·3775	0·6
18	22 9 39	55 34·6	0·3335	0·3855	0·5
22	22 26 51	57 10·3	0.3411	0·3938	0·5
26	22 44 30	58 37·8	0·3486	0·4025	0·4
30	23 2 32	59 57·2 N.	0·3560	0·4113	0·4

The brightness at discovery is taken as unity.

COMET 1887 *d* (BARNARD, FEBRUARY 15).—Prof. Boss supplies the following elements and ephemeris for this object from observations made on February 16, 18, and 20:—

$$T = 1887 \text{ April } 6{\cdot}77 \text{ G.M.T.}$$

$$\left.\begin{aligned}\pi &= 203^\circ\ 13'\\ \Omega &= 139\ \ 16\\ \iota &= 126\ \ \ 2\end{aligned}\right\}\text{ Mean Eq. } 1887{\cdot}0$$

$$\log q = 9{\cdot}8892$$

Ephemeris for Greenwich Midnight

1887		R.A. h. m.		Decl. ° ′		Brightness
March 2	...	3 56·7	...	29 21 N.	...	0·38
4	...	3 40·0	...	31 18	...	
6	...	3 26·5	...	32 48 N.	...	0·32

The brightness at discovery is taken as unity.

A METHOD FOR THE DETERMINATION OF THE CONSTANT OF ABERRATION.—M. Lœwy, in reply to M. Houzeau's claim to be considered the originator of the method for determination of aberration by measurement of the relative positions of two stars situated in distant parts of the sky (NATURE, vol. xxxv. p. 377) points out, in the *Comptes rendus*, tome civ. No. 7, that the invention of a new method for the determination of the constant of aberration does not consist in a general indication of the effect of aberration on a certain observation or combination of observations, but in furnishing definite rules the following out of which will lead to results of the accuracy demanded by the exigencies of modern science. M. Lœwy maintains that M. Houzeau's researches on the subject come under the former category, whilst his own are entitled to be ranked under the latter.

The same number of the *Comptes rendus* contains a note by M. Trépied pointing out how photography can be applied for the purpose of practically carrying out M. Lœwy's method.

THE HARVARD COLLEGE OBSERVATORY.—From Prof. Pickering's Report, presented on December 7, 1886, we learn that during the past year the east equatorial has been used for the photometric observation of the eclipses of Jupiter's satellites upon the system adopted in 1878. The total number of eclipses thus observed is 358, of which 39 have occurred since the end of October 1885. With the same equatorial the observation of comparison stars for variables with the wedge photometer has been continued, and has formed the principal work of the instrument. The "new" stars in Orion and Andromeda, and comets, have also been observed with the east equatorial throughout the year. The reduction and publication of work already done with the meridian-circle is at present, in Prof. Pickering's opinion, more desirable than the prosecution of new series of observations. This department of the Observatory has sustained a heavy loss in the resignation of Prof. Rogers, who has devoted many years to laborious astronomical work at Harvard College. During the year ending November 1, 1886, 209 series of measures have been made with the meridian-photometer. The total number of separate photometric comparisons is 59,800. The instrument continues to give entire satisfaction as a means of measuring the brightness of stars of the ninth magnitude or brighter. The average deviation of 100 circumpolar stars used as standards, which, with the smaller instrument of the same kind employed in the Harvard photometry, was 0·16 of a magnitude, has been reduced to 0·12 with the present instrument; whilst the average deviation of stars from the fifth to the ninth magnitude but little exceeds 0·1 of a magnitude. And a comparison between the results obtained by Dr. Lindemann, at Pulkowa, with a Zöllner photometer, and at Harvard College, with the meridian-photometer, shows that the average deviation of a measurement of the difference in brightness between two stars observed at both places does not exceed 0·1 of a magnitude. For an account of the interesting and important researches in stellar photography which have recently been carried out at the Harvard College Observatory, see NATURE, vol. xxxv. p. 37.

NEW MINOR PLANET.—A new minor planet, No. 265, was discovered on February 27, by Herr Palisa, at Vienna. This is the fifty-eighth that Herr Palisa has discovered.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1887 MARCH 6–12

(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 March 6

Sun rises, 6h. 37m.; souths, 12h. 11m. 28·1s.; sets, 17h. 46m.; decl. on meridian, 5° 40′ S.: Sidereal Time at Sunset, 4h. 43m.

Moon (Full on March 9) rises, 13h. 39m.; souths, 21h. 29m.; sets, 5h. 10m.*; decl. on meridian, 17° 4′ N.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian ° ′
Mercury	6 54	13 15	19 36	3 22 N.
Venus	7 20	13 35	19 50	2 16 N.
Mars	7 0	12 54	18 48	1 58 S.
Jupiter	22 19*	3 21	8 23	12 2 S.
Saturn	12 2	20 11	4 20*	22 28 N.

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

Occultations of Stars by the Moon (visible at Greenwich)

March	Star	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image ° °
6	*f* Geminorum	6	0 41	1 40	131 289
8	18 Leonis	6	4 1	4 39	67 337
8	45 Leonis	6	18 24	19 14	68 185
8	ρ Leonis	4	20 50	21 54	61 111
8	49 Leonis	6	22 53	near approach	332 —
11	γ Virginis	2½	3 7	3 40	145 210
11	B.A.C. 4277	6	4 22	near approach	186 —

March	h	
12	3	Mercury stationary.
12	20	Jupiter in conjunction with and 3° 34′ south of the Moon.

Saturn, March 6.—Outer major axis of outer ring = 44″·0; outer minor axis of outer ring = 18″·3; southern surface visible.

Variable Stars

Star	R.A. h. m.	Decl. ° ′			h. m.	
U Cephei	0 52·3	81 16 N.	Mar.	7,	19 36	*m*
S Arietis	1 58·6	11 59 N.	,,	6,		*M*
T Cancri	8 50·2	20 17 N.	,,	9,		*m*
R Ursæ Majoris	10 36·7	69 22 N.	,,	11,		*M*
T Virginis	12 8·8	5 24 S.	,,	7,		*M*
S Ursæ Majoris	12 39·0	61 43 N.	,,	10,		*M*
W Virginis	13 20·2	2 48 S.	,,	12,	5 0	*M*
δ Libræ	14 54·9	8 4 S.	,,	9,	23 39	*m*
U Coronæ	15 13·6	32 4 N.	,,	6,	18 46	*m*
R Scorpii	16 10·9	22 40 S.	,,	11,		*M*
U Ophiuchi	17 10·8	1 20 N.	,,	7,	5 46	*m*
		and at intervals of			20 8	
U Sagittarii	18 25·2	19 12 S.	Mar.	9,	3 0	*m*
β Lyræ	18 45·9	33 14 N.	,,	9,	1 0	*m*
S Vulpeculæ	19 43·8	27 0 N.	,,	12,		*M*
η Aquilæ	19 46·7	0 43 N.	,,	9,	5 0	*m*
δ Cephei	22 25·0	57 50 N.	,,	12,	0 0	*m*

M signifies maximum; *m* minimum.

ON RADIANT-MATTER SPECTROSCOPY:—EXAMINATION OF THE RESIDUAL GLOW[1]

I.

THE duration of phosphorescence after cessation of the exciting cause is known to vary within wide limits of time, from several hours in the case of the phosphorescent sulphides to a minute fraction of a second with uranium glass and sulphate of quinine. In my examinations of the phosphorescent earths glowing under the excitement of the induction discharge *in vacuo*, I have found very great differences in the duration of the residual glow. Some earths continue to phosphoresce for an hour or more after the current is turned off, while others cease to give out the light the moment the current stops. Having succeeded in splitting up yttria into several simpler forms of matter differing in basic power (Roy. Soc. Proc. vol. xl. pp. 502–509, June 10, 1886), and always seeking for further evidence of the separate identity of these bodies, I noticed occasionally that the residual glow was of a somewhat different colour to that it exhibited while the current was passing, and also that the spectrum of this residual glow seemed to show, as far as the faint light enabled me to make out, that some of the lines were missing. This pointed to another difference between the yttrium components, and with a view to examine the question more closely I devised an instrument similar to Becquerel's phosphoroscope, but acting electrically instead of by means of direct light.

The instrument, shown in Fig. 1, A and B, consists of an opaque disk, *a b c*, 20 inches in diameter, and pierced with twelve openings near the edge as shown. By means of a multiplying wheel, *d*, and band, *e f*, the disk can be set in rapid rotation. At each revolution a stationary object behind one of the apertures is alternately exposed and hidden twelve times. A commutator, *g* (shown enlarged at Fig. 1, B), forms part of the axis of the disk. The commutator is formed of a hollow cylinder of brass round a solid wooden cylinder. The brass is cut into two halves by a saw cut running diagonally to and fro round it, so as to form on each half of the cylinder twelve deeply cut teeth interlocking, and insulated from those on the opposing half cylinder by an air space about 2 mm. across. Only one half, *h h h*, of the cylinder is used, the other, *i i i*, being idle; it might have been cut away altogether were it not for some little use that it is in saving the rubbing-spring, *j*, from too great friction when passing rapidly over the serrated edge. To a block beneath the commutator are attached two springs, one, *k*, rubbing permanently against the continuous base of the serrated hemicylinder *h h*, and the other, *j*, rubbing over the points of the teeth of *h h*. By connecting these springs with the wires from a battery it will be seen that rotation of the commutator produces alternate makes and breaks in the current. The spring, *j*, rubbing against the teeth is made with a little adjustment sideways, so that it can be said to touch the points of the teeth only, when the breaks will be much longer than the makes, or it can be set to rub near the base of the teeth, when the current will remain on for a much longer time and the intervals of no current will be very short. By means of a screw, *l l*, attached to the spring, any desired ratio between the makes and the breaks can be obtained. The intermittent primary current is then carried to an induction coil, *m*, the secondary current from which passes through the vacuum tube, *n*, containing the earth under examination. When the commutator, the coil-break, and the position of the vacuum tube are in proper adjustment, no light is seen when looked at from the front if the wheel is turned slowly (supposing a substance like yttria is being examined), as the current does not begin till the tube is obscured by an intercepting segment, and it ends before the earth comes into view. When, however, the wheel is turned more quickly, the residual phosphorescence lasts long enough to bridge over the brief interval of time elapsing between the cessation of the spark and the entry of the earth into the field of view, and the yttria is seen to glow with a faint light, which becomes brighter as the speed of the wheel increases.

To count the revolutions, a projecting stud, *o*, is fastened to the rotating axis, and a piece of quill, *p*, is attached to the fixed support, so that at every revolution a click is produced. With a chronograph watch it is easy in this way to tell the time, to the tenth of a second, occupied in ten revolutions of the wheel.

Under ordinary circumstances it is almost impossible to detect any phosphorescence in an earth until the vacuum is so high that the line spectrum of the residual gas begins to get faint; otherwise the feeble glow of the phosphorescence is drowned by the greater brightness of the glowing gas. In this phosphoroscope, however, the light of glowing gas does not last an appreciable time, whilst that from the phosphorescent earth endures long enough for it to be caught in the instrument. By this means, therefore, I have been able to see the phosphorescence of yttria, for example, when the barometer gauge was 5 or 6 mm. below the barometer.

When the earth under examination in the phosphoroscope is yttria free from samaria, and the residual emitted light is ex-

[1] Paper read before the Royal Society by Mr. William Crookes, F.R.S., on Feb. 17.