THE annual report of the Smithsonian Institution for the year ending June 1896 has been received. It is well known that the value of Smithsonian Reports lies not so much in the account of the operations and conditions of the Smithsonian Institution as in the collection of papers on various scientific subjects, included in the appendix. The report of the Secretary on the work of the Institution is published many months in advance of the volume containing it and the appendix referred to. In the present volume this report, and general administrative affairs, occupy only 77 pages, while the appendix, containing a selection of papers (some of them original), embracing a wide range of scientific investigation and discussion, occupies more than six hundred pages. These pages consist of addresses delivered at scientific meetings, and upon other occasions, reprints and translations of contributions to scientific periodicals, and reports on some investigations carried on under the auspices of the Smithsonian Institution. There are thirty memoirs of this kind in the present report, and together they form a most interesting statement of work and progress in many branches of science.

THE additions to the Zoological Society's Gardens during the past week include two Arabian Baboons (*Cynocephalus hamadryas*, ♂ ♀) from Arabia, presented by Dr. H. O. Forbes and Mr. W. R. Ogilvie-Grant; a Rhesus Monkey (*Macacus rhesus*, ♀), a Macaque Monkey (*Macacus cynomolgus*, ♂) from India, presented by Mr. P. de Loriol; a Patas Monkey (*Cercopithecus patas*, ♂) from West Africa, presented by Mr. C. H. Wimpress; a Black-backed Jackal (*Canis mesomelas*) from South Africa, presented by Mr. Fraser; a Nankeen Night Heron (*Nycticorax caledonicus*) from Australia, presented by Mr. John Brinsmead; two Diamond Pythons (*Python spilotes*) from Australia, presented by Mr. S. A. Michels; a Grey Lemur (*Hapalemur griseus*) from Madagascar, an Argali Sheep (*Ovis ammon*, ♂) from the Altai Mountains, deposited; four Ruddy-headed Geese (*Chloephaga rubidiceps*), bred in Holland, purchased.

OUR ASTRONOMICAL COLUMN.

COMET CHASE.—The following ephemeris for Comet Chase will be found serviceable by those who wish to observe this object. It has been calculated by Herr J. Möller, and is as follows:—

Berlin Midnight.

1899.	R.A. (app.). h. m. s.	Dec. (app.). ° ′
Jan. 27 ...	11 9 35 ...	+33 35·9
29 ...	9 16 ...	33 57·9
31 ...	8 52 ...	34 19·5
Feb. 2 ...	8 23 ...	34 40·5
4 ...	11 7 48 ...	+35 1·0

The brightness of the comet is about the same as at the time of discovery.

NEW VARIABLE STAR IN ANDROMEDA.—Dr. T. D. Anderson announces (*Astr. Nachr.*, No. 3539) a new variable star in Andromeda, the approximate position of which for 1855 is

R.A. 2 h. 8 m. 23 s. ... Dec. +43° 37′·8

Using for comparison stars BD + 43°·457, 460 and 462, and estimating their respective magnitudes as 9·2, 8·8 and 9·7, he found the following values for the magnitude of this variable:—

1898 Dec. 3	Mag. 9·1
6	9·1
28	9·5
1899 Jan. 3	9·6
7	9·7

The star has thus rapidly decreased six-tenths of a magnitude in this short period, and it will be interesting to follow the variation further.

WITT'S PLANET (433) DQ.—The recent *Harvard College Observatory Circular* (No. 36) gives an account, with the results, of a search for the planet Witt among some negatives of star regions taken at that observatory. With the help of Mr. Chandler, who furnished an ephemeris based on the best material, Mrs. Fleming undertook the examination of the plates for the year 1894; but in the first instance, although the latter examined a region covering 1300 square degrees, the planet was not found. The next search was made upon the plates taken in 1896, as the errors of the ephemeris would not then be so great, and might possibly compensate for the extreme faintness of the planet. The result of this search was that at last a faint image was found on a plate taken on June 5, 1896, and this was confirmed on plates exposed on June 5 and 6.

From these positions the ephemeris was corrected, and positions for 1894 computed. A further examination by Mrs. Fleming brought to light impressions of the planet on several other plates taken in 1894 and 1893, In addition to the positions of the planet at the times each of these photographs was obtained, Prof. Pickering publishes in the present *Circular* an ephemeris from 1893 October 27 to 1894 April 21, computed by Mr. Chandler from a combination of the observations of 1898, and the photographs taken on December 19 and 27, 1893; February 16, 1894; April 6, 1896; and June 4 and 5, 1896.

The elements calculated by Mr. Chandler from such a combination of positions are the following:—

Elements.

Epoch 1898, August 31·5 G.M.T.

M =	221° 35′ 45″·6	
ω =	177 37 56·0	1898·0
Ω =	303 31 57·1	1898·0
i =	10 50 11·8	1898·0
φ =	12 52 9·8	
μ =	2015″·2326	
log *a* =	0·1637876	
Period =	643·10d.	

It may be mentioned that further images of the planet have been found on plates taken in November 26, December 23, 1893, and in January 19, 25, 30, and February 5 of the following year.

On a previous occasion in this column (December 1, 1898, p. 108) we drew attention to a suggestion by Prof. Chandler, who gave his reasons why Pluto would be an appropriate name for this new planet. In the *Astronomische Nachrichten* (No. 3539), Dr. G. Witt, the discoverer of the planet, proposes to call it by the name Eros, hoping that this will be found suitable for such an important little body.

THE HAMBURG OBSERVATORY.—Prof. F. Küstner, the director of the observatory at Bonn, has been appointed to take over the directorship of the Hamburg Observatory, in succession to Prof. G. Rümker, who has, we are sorry to say, retired owing to prolonged illness.

THE LEONIDS IN 1898.—Several additional accounts of the observations of the Leonids at different stations are published in the *Astronomische Nachrichten* (No. 3538). Those made at Vienna and Pola seem of special interest. In Vienna the three nights of the 13th, 14th and 15th were useless for observation; but Dr. Palisa, with Herr J. Rheden, ascended the "Semmering," and were fortunate in having clear weather after midnight on the night of the 13th. Between 3h. and 5h. 30m. twenty-two meteors were seen, thirteen of which were Leonids, but all below the second magnitude. On the evening of the 14th, Prof. E. Weiss also ascended to this point, taking with him two photographic cameras. Between 3h. 15m. and 5h. 45m. about 250 meteors were seen, two-thirds of which were estimated as Leonids, and several brighter than Venus. On the photographic plates six trails were recorded, one of which belonged to an interesting meteor which was observed to be as bright as Jupiter, and came from the radiant R.A. 153° + 23°. On the night of the 15th, Dr. Palisa and Herr Rheden, observing from the same station between 10h. 45m. p.m. and 2h. 30m. a.m., saw fifty meteors, many of which were very bright, but only about twenty-five of them Leonids. These observations indicate that the forerunners of the swarm reached the earth in the night of the 13th–14th, the maximum being reached probably during the day of the 15th. Prof. Weiss adds that the passage through these meteors lasted for more than twenty-four hours, suggesting

that the width of the swarm had increased very considerably since 1866.

In Pola, on the night of the 15th, the meteors seem to have been well seen, eighty-three being observed, thirty-four of which were Leonids. The maximum of the display is stated to have taken place at 16h. 48m. Pola M.T., the radiant point deduced from twenty-two of the best observations being R.A. 10h. 12m. + 26°·5.

STUDIES OF THE LUNAR PHOTOGRAPHS TAKEN WITH THE LARGE EQUATORIAL COUDÉ.[1]

THE new part of the "Atlas of the Moon," which we offer to the public to-day, presents many points of comparison with sections previously published. But, on account of changes of the moon's age and her libration, the portions common to both serve no double purpose. The comparison of the negatives, as we shall see more especially by studying Plates XV. and XVI., enables us to interpret some dark markings, to establish a finer distinction between the unevenness of the surface and the variations from the ordinary colour, and finally to determine more precisely the points where the reality of a periodic change may be presumed.

Plate *c* is the third in our publication, in which the whole of the moon, visible simultaneously from the earth and sun, is represented. This portion is here much more restricted than has already appeared in Plates *a* and *b*. The new sheet is, in consequence, less rich in detail, but derives a particularly expressive appearance, due to the rapid change from shadow to light. It is naturally the general features of the physiognomy of our satellite, the laws of distribution of plains and mountains, which can be usefully studied on these unenlarged pictures. We call special attention to the polygon form of the *Mer des Crises*, which is the best defined of all the dark plains of the moon; to the traces of progressive depressions which are presented in its central portions; to the large rectilinear valleys which are visible in the southern part of the disc; to the alignment following a meridian of the four most important circles of the southern horn; to the existence of a long series of dark spots on another meridian near the limb. We find altogether, in this part of the moon, a well-marked relation between the local appearance of the surface and longitude. This relation is interesting to note, owing to the probability of its being connected with the mechanical work of tides caused by the earth.

The three unenlarged proofs published as yet demonstrate several important facts, which are confirmed by a number of clichés in our possession. They are:—

(1) A nearly continuous progression of light, extending from the terminator to the illuminated limb, approximately coincident with the curves of equal illumination and the meridians.

(2) A recrudescence of illumination in the neighbourhood of the poles, and principally of the South Pole.

(3) A marked increased of luminous intensity in the immediate neighbourhood of the limb.

A satisfactory theoretical explanation is possible for the first law, if the moon be regarded as a uniform globe in its superficial constitution, without appreciable atmosphere, beyond the state of exercising a sensible specular reflection, and reflecting indifferently in every direction the light received. Under these conditions the formula which expresses the relative intensity, and which will be found in the note relating to Plate *c*, indicates that the curves of equal illumination are the meridians, and that the intensity must increase from the terminator to the limb.

The slight exception to this rule, which is apparent near the poles, already attracted our attention when we described Plates I., II. and VI. We there saw the proof that these portions of crust very soon became solidified and rapidly acquired a great thickness. By this the polar caps have escaped the inundations originating from the interior, which have changed the appearance of the equatorial region. They are found to receive more rapidly the deposits of white cinders of the volcanic period, chief cause of the difference of tints which we observe to-day.

One may attempt to go further back, and to account for the early solidification of the polar regions. It is evident, to begin with, that the cooling must progress more quickly under the influence of a less efficient solar radiation. We will add that the tides of terrestrial origin caused smaller oscillations than in the equatorial regions, and having a slower velocity of propagation. The congealing of the superficial scoriæ is, therefore, much more easily effected near the poles.

The third fact, that is to say the abnormal increase of luminosity near the limb, merits more attention, because it is not the result of the mode of operation adopted, which, on the contrary, would be of a nature to weaken it. It shows itself in every latitude, and in all phases. In particular, the photographs taken during the partial eclipse of January 7, 1898, show that the increase of intensity on the edge is still very appreciable at opposition—that is to say, at the moment when calculation would assign a uniform brilliancy to the lunar disc.

It seems that no purely geometrical theory accounts for this appearance if it is not supposed that it is really connected with the physical state of the surface—that is to say, that not only the polar caps, but all the regions which form the apparent "contour" of the moon are, collectively, of a lighter colour than the other parts of the disc.

Here, again, the tides of terrestrial origin, already studied from other points of view by MM. Faye and Poincaré, appear to have played an essential part. Their character is entirely modified, since the day when the rotation of the moon upon its axis was equal to the period of revolution. The periodical flow, which formerly invaded the whole equatorial region, finished by accumulating in the portion of the disc which the earth sees at the present day near its zenith. Besides this our globe, still incandescent, was really a source of great heat for its satellite. The regions near the limb have therefore entered, in their turn, into this period of low temperature and relative calm which is favourable to the consolidation of the polar regions.

The real characters of the high latitudes, already notified in the previous part, can be more completely studied here on Plates XIII. and XVII. The latter shows us the South Pole covered with mountains, varying in height from 6000 to 7000 metres, the highest that have been measured on the moon. These depths are not entirely due to the hollow of the walled plains. Although very numerous, sufficient space is left between them to allow us to judge of what was the previous contour. It can be seen that it comprised very high ridges which the craters have encroached on without destroying, and without themselves losing the regularity of their contour. There have thus been formed between the different parts of the same enclosure, differences of level which mount up to 1500 or 2000 metres. The most elevated points, which seem to correspond to a very thick crust, and capable of offering great resistance are, on the contrary, often full of little craters. The general appearance of the region gives rise to the thought, as we have already said of Plate VI., that there does not exist a covering of ice at the poles, and that it has not produced an active erosion there.

If we now consider Plate XIII. in the neighbourhood of the North Pole, we see the walled plains occupying a still more secondary place. Here the seas advance to very high latitudes. Long mountainous masses exist between them, as, for instance, the Alps and the Caucasus. These ranges, situated at a higher level than that of the seas, are strewn with summits presenting well-marked alignments, but no sign of ramified valleys, and very little circular formation. They are broken up into several fragments by rectilinear fissures, of which the great valley of the Alps constitutes the most celebrated and best example. The portions thus separated seem to have undergone sliding movements in relation to one another. Considerable difference of level is manifested in one *massif*, in such a manner that it ends at one side by a very high and very steep descent, while the other descends insensibly to the seas. The signs of primitive level have no other common feature with the terrestrial mountains than their great relative altitude, and prolonged atmospheric agencies would be necessary to make them acquire new features of resemblance with them. If the North Pole is approached, it will be seen that at the surface a net-work of furrows are formed in such a manner as to produce rectangular basins. The higher the latitude, the more important these movements of the ground become; and it is credible that, if we could see past the apparent contour of the moon, we would observe a relief comparable with that of the South Pole. The undeniable difference which to-day exists between the appearance of the two poles is favourable to the views of G. H. Darwin and other geometers, who estimate, for reasons derived from celestial mechanics, that

[1] Translation of a paper by MM. Lœwy and Puiseux. (Published by the Paris Observatory.)