Colombia, presented by Mr. R. E. Stone; two Common Duikers (*Cephalophus grimmi*), six Swainson's Francolins (*Pternistes swainsoni*) from South Africa, presented by Mr. J. E. Matcham; a Suricate (*Suricata tetradactyla*) from South Africa, a Common Hamster (Albino) (*Cricetus frumentarius*), European; an Antillean Boa (*Boa diviniloque*) from the West Indies, deposited; two Spotted Turtle Doves (*Turtur suratensis*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

HOLMES' COMET 1899 *d* (1892 III.).

Ephemeris for 12h. Greenwich Mean Time.

1899.	R.A.	Decl.	Br. r^{-2}	Br. $(r\Delta)^{-2}$
	h. m. s.	° ′ ″		
August 17	2 51 17·17	+36 29 53·4		
18	52 16·44	36 45 24·3		
19	53 14 43	37 0 51·8		
20	54 11·12	37 16 15·8	0·1905	0·04889
21	55 6·48	37 31 36·3		
22	56 0·47	37 46 53 2		
23	56 53·06	38 2 6·3		
24	2 57 44 22	+38 17 15·7	0·1888	0·04999

MOTION OF APSE LINE OF α GEMINORUM.—In a previous communication to the *Mem. Soc. Degli Spett. Ital.* (vol. xxvi., 1897), M. A. Belopolsky has drawn attention to the rapid motion of the line of apsides in the system of α Geminorum (Castor), and now, in the last issue of the same journal (vol. xxviii. pp. 103–108, 1899), he gives the results of more recent work on this interesting double star. The former measures were obtained from a series of spectrographs obtained at Pulkowa during one year, and were not sufficiently representative to give certain results. He has now at his disposal observations which he has made during the past three years, and in the present paper confines himself to the examination of three groups of these observations, reserving the discussion of the whole for a later article. These groups of observations embrace the periods: (1) 1896, March 8 to April 26; (2) 1898, March 15 to May 2; (3) 1899, January 19 to April 16. In the calculation several difficulties are found, the chief of which are the rapid movement (period 2·93 days), the uncertainty of a few thousandths of the period producing an error of several degrees in the true anomaly, and also the uncertainty of the time of passage through *Periastron*.

Tables are given showing comparisons between the calculated and observed values for the velocity in the line of sight, for all the dates in the three groups of observations, from which the author concludes that the probable error is only about ± 0·368 l.g. (± 0·92 miles). He finally concludes that the observed rapid movement of the line of apsides is real, and that the *period of this revolution* is

4 years 40 days = 2100 days.

He attributes the cause of this to the probable flattening of the components, and mentions that a flattening of one-seventh would be sufficient, if the dimensions of the system are equal to those of Algol, to produce the observed motion.

MR. TEBBUTT'S OBSERVATORY.—In presenting his report of the work done at his observatory at Windsor, New South Wales, during the year 1898, Mr. John Tebbutt states that the past year was remarkable for the large number of clear nights during the autumn, winter and spring months, rendering it possible to get a large amount of work done.

Meridian work was carried out with a 3-inch Cooke transit, the timekeeper being a Poole 8-day chronometer.

Extra-meridian work consisted of observations of occultations, planets, and comets. With the 8-inch equatorial thirty-six disappearances at the moon's dark limb were measured and the results published. The same instrument, in conjunction with the Grubb filar micrometer, was employed on fifty-seven nights in planetary observation; 73 comparisons of Vesta, 211 of Iris, 107 of Isis, 91 of Jupiter and η Virginis, 132 of Uranus and ω^1 Scorpii, and 132 of Uranus and ω^2 Scorpii, were recorded; and comparisons with the measures published by other observers have proved to be very satisfactory.

The observations of comets have been made with both the 4½-inch and 8-inch equatorials, and have included measures of Encke's Comet, and Comet Coddington-Pauly, the latter being followed from June 15 to March 3, 764 measures of the comet and 138 of comparison stars being made on 103 nights during that period.

Attempts to observe Comets Perrine, *e* and *h*, 1898, were unsuccessful owing to their proximity to the sun.

All the observations, computations and reductions have been made by the proprietor of the observatory it being extremely difficult to obtain even occasional assistance.

TEMPERATURES IN GASEOUS NEBULÆ.—Mr. F. E. Nipher, in a paper read before the Academy of Science, St Louis (vol. ix., No. 4), discussed the conditions of temperature, &c., in a gravitating nebula having *uniform temperature* throughout its mass. In a second paper he now discusses the same subject on the different assumption that the initial temperature *diminishes* from the centre outwards. After a lengthy mathematical discussion he derives a general formula

$$T = T_0(1+n)\left(\frac{r_0}{r}\right)^{1-n}$$

which reduces to Ritter's equation if the temperature of the mass be assumed initially uniform. He concludes that in general the temperature throughout a nebula is to be given in terms of the coordinates of the point in space where the temperature is to be determined, and the *ratio of contraction* from any given initial condition. If the temperature remains constant throughout the mass, then Ritter's equation would hold during contraction. If on account of unequal permeability to heat the temperature should become unequal, the law of temperature change as a function of the ratio of contraction becomes more complex, so that if at any time the temperature varies inversely as the *n*th power of the distance from the centre, the ratio of temperature change at any contracting surface will be given by the above equation, in which it is evident, from physical conditions, that *n* cannot be less than zero.

THE RECENT PERSEID METEORIC SHOWER.

A SERIES of very clear nights enabled the Perseids to be well observed this year. The shower was not of unusual brilliancy, but it furnished a considerable number of meteors, and they appear to have been widely observed. The occurrence of the Perseid display now excites not only the attention of the meteoric enthusiast, but is seriously observed by astronomers generally, and the application of photography to work of this kind has greatly stimulated the interest in it.

On August 9 the writer watched the north-eastern sky between about 10h. 15m. and 13h., but a few clouds prevailed during the first hour. 38 meteors were seen, of which 26 were Perseids. On August 10, between about 10h. and 13h. 30m., 91 meteors were seen, of which 72 were Perseids. On August 11, between 10h and 13h. 30m., 90 meteors were observed, including 68 Perseids. On August 12, between 10h. and 13h. 30m., 62 meteors were counted, and amongst these were 43 Perseids. On August 13, 23 meteors (10 Perseids) were seen in 2 hours, and on August 14, 29 meteors (12 Perseids) were recorded in 2¼ hours.

On August 10, between 11h. 10m. and 14h. 35m., Prof. A. S. Herschel at Slough observed 104 meteors, and after making allowance for time spent in registering the paths the horary number of meteors for one observer would be about 40. He describes the maximum as having been observed between 12h. and 12h. 30m., when several bright meteors succeeded each other at short intervals.

On August 10 Mr. T. H. Astbury, observing at Shifnal, Salop, says that thirty-four meteors were seen between 10h. and 11h., the great majority being Perseids. There was also an active radiant in Cygnus.

On August 11 only about eighteen meteors were seen from 10h. till 11h., so that he concluded the maximum occurred on the 10th, when the meteors were brighter and more numerous.

According to the Bristol observations already alluded to, very little decline in numbers was, however, noticed on August 11, and to exhibit this more readily, the following table has been compiled:—

Date.	Time of observation. h. h.	Actual length. hrs.	Meteors seen.	Perseids.	Radiant. α δ ° °
Aug. 9	$10\frac{1}{4}$–$12\frac{3}{4}$	2	38	26	44 + 57
10	10 –$13\frac{1}{2}$	3	91	72	44 + 57
11	10 –$13\frac{1}{2}$	3	90	68	46 + 57
12	10 –$13\frac{1}{2}$	3	62	43	48 + 57
13	10 –$12\frac{1}{2}$	2	23	10	49 + 58
14	10 –$12\frac{1}{2}$	$2\frac{1}{4}$	29	12	50 + 56

The meteors seen on the 10th were, however, rather brighter on the whole than those on the 11th. The largest meteors were as follows:—

No.	Date.	Time.	Mag.	Path. From ° °	To ° °
1	Aug. 9	11 4	♃	15 + 28	11 + 21
2		11 32	♃	$296\frac{1}{2}$ + 57	278 + $36\frac{1}{2}$
3		12 7	♀	239 + 60	235 + 37
4	Aug. 10	10 14	♀	293 + 60	271 + 38
5		10 54	♃	$23\frac{1}{2}$ + 38	17 + 29
6		11 36	♃	$49\frac{1}{2}$ + $37\frac{1}{2}$	$50\frac{1}{2}$ + 32
7		13 18	♃	50 + 67	58 + 73
8	Aug. 11	11 9	♃	$18\frac{1}{2}$ + 51	5 + $44\frac{1}{2}$
9	Aug. 12	10 16	♃	$5\frac{1}{2}$ + 6	1 − 6
10		10 39	♃	326 + $1\frac{1}{2}$	318 − 11
11		12 $1\frac{1}{2}$	♀	$4\frac{1}{2}$ + 43	347 + $27\frac{1}{2}$

No. 3 was also seen by Prof. Herschel, and No. 4 by Mr. Astbury. The majority of the remainder were seen by various other observers, and their real paths will be calculated.

On August 12 the shower had markedly declined, though it was tolerably active between 10h. and 11h. The position of the radiant point exhibited the usual diurnal motion to the eastward. On July 29–August 2, eight meteors observed at Bristol denoted the radiant at 34° + 54°, and on August 6, six meteors fixed it at 40° + 55°. On August 12 it was in 48° + 57° and on August 14 in 50° + 56°.

Several remarkable meteors with very slow motion, and leaving trains of sparks, were recorded on August 12. One of the most striking of these appeared at 12h. 31m. It was of the 1st mag., and traversed a path of 33 degrees from 341° + 81° to 124° + 64° in about seven seconds. As it fell almost perpendicularly down the northern sky the nucleus poured out a stream of yellow sparks. Probably the radiant was near the southern horizon, and it is hoped that other observers will send in reports of this curious meteor, and enable its true radiant to be found.

Altogether the display seems to have been of average importance, and to have fallen below the observed strength of the shower on August 11, 1898. Many of the minor showers of the period made themselves apparent, though they were generally very feeble. The principal of them were at 41° + 20°, 333° + 26°, 345 ± 0, 315° + 77°, 339° − 11° and 17° + 31°. It is to be hoped that at places where the photographic method has been applied the results have been successful.

W. F. DENNING.

UNITED STATES DEEP-SEA EXPLORING EXPEDITION.

THE announcement that the U.S. Fish Commission steamer, *Albatross*, would shortly be despatched on an exploring expedition to the Pacific Ocean, has already been noticed in these columns. Particulars of the main objects of the expedition, and the route to be followed, are given by Mr. H. M. Smith in the *National Geographic Magazine*, from which the subjoined account has been abridged.

The *Albatross* is the best-equipped vessel afloat for deep-sea investigation, for which work she was especially constructed for the Fish Commission in 1882, at a cost of nearly 200,000 dollars. She is a twin-screw steamer of 384 tons burden, 234 feet long and $27\frac{1}{2}$ feet beam. A full account of the construction of the *Albatross* and her appliances for marine investigation has been given in the admirable work on "Deep-sea Exploration," by Commander Z. L. Tanner, U.S.N., under whose direction the vessel was built and who was in command from the date of her launching until 1894. The reputation long enjoyed by the *Albatross* of being unequalled in effectiveness for marine research will be more than ever deserved on the approaching cruise because of the extensive improvements and repairs she has recently undergone, including the installation of new boilers, ice-making machine, cold-storage plant, &c., together with the thorough replenishing of the scientific outfit.

The *Albatross* will pass through the Golden Gate on August 21 and begin her long voyage to certain groups of islands in the middle of the Pacific Ocean, both north and south of the equator, whose local fauna is almost unknown, while in the adjacent waters little or no scientific investigation has been carried on. The Society islands will be first visited, although the vessel will touch at the Marquesas islands for coal. Between San Francisco and Tahiti, a distance of 3500 miles, dredging and sounding will be carried on at regular intervals on a section of the sea-bottom almost wholly unexplored. Tahiti will be the headquarters while the Society islands and the Paumota islands are being explored. In the latter archipelago, which is about 600 miles long, six or eight weeks will be spent and important scientific discoveries should be made. In the Tonga or Friendly islands, distant about 1500 miles from the Society group, a week or ten days will be passed. The vessel will then proceed to the Fiji islands, where a short stay will be made, and thence 1700 miles to the Marshall islands, in which interesting archipelago, of whose natural history almost nothing is known, six or seven weeks will be devoted to exploration. The Ellice and Gilbert islands, lying between the Fiji and Marshall islands, will also be visited. It was originally the intention to have the *Albatross* proceed from the Marshall islands to the Hawaiian islands and thence to San Francisco, running a line of deep-sea dredgings along the entire route; but, owing to the prevalence of head winds at the time when the vessel will be ready to leave the Marshall islands, this plan has been abandoned, and instead the vessel will sail for Japan, making frequent use of the dredge and the deep-sea tow-net and setting the trawl in the moderately deep water off the Japan coast, where the fishermen are continually bringing up curious forms. The voyage of nearly 20,000 miles will come to an end at Yokohama, where the *Albatross* will arrive in April 1900, and refit for a summer cruise to Alaska to resume the systematic examination of the salmon streams begun several years ago.

The leading features of the expedition will be deep-sea dredging, trawling, and sounding, and some special appliances for such work have been constructed. A wire dredge-rope 6000 fathoms long has been made to order, and to accommodate this enormous quantity a special drum has had to be prepared. It is expected that both the dredge and the beam-trawl will be hauled in deeper water than heretofore. One of the novel pieces of collecting apparatus is a beam-trawl of unprecedentedly large size, especially designed for the capture of larger animals than can be taken with the usual apparatus.

While the deep-sea investigations will receive the most attention, surface and intermediate towing, shore-seining, and fishing trials with lines, gill-nets, and other appliances will be regularly carried on and will undoubtedly yield rich collections. The region to be visited abounds in atolls and elevated reefs, many of which will be visited and studied for the purpose of obtaining data bearing on the disputed question of the origin of coral reefs.

The *Albatross* is manned by about ten officers and seventy petty officers and enlisted men of the United States Navy. The commanding officer is Lieutenant Commander Jefferson F. Moser, U.S.N. The civilian staff on this expedition consists of Prof. Alexander Agassiz, in charge of the scientific work, who will be accompanied by his son and his personal assistants; Dr. W. McM. Woodworth and Dr. A. G. Mayer, of the Museum of Comparative Zoology, Cambridge, Mass.; Dr. H. F. Moore, chief naturalist of the *Albatross*; Mr. Charles H. Townsend, formerly naturalist, now chief of the fisheries division of the U.S. Fish Commission; Mr. A. B. Alexander, fishery expert, and Mr. H. G. Fassett, photographer, both of the U.S. Fish Commission.

Opportunity will undoubtedly be afforded for conducting a number of important collateral inquiries without detriment to the regular scientific work. Advantage will be taken of every chance to obtain for the National Museum specimens of the mammals, birds, insects, and other land animals of the various islands visited. A study of the aboriginal fishing methods, apparatus, and boats, and the collection of specimens of the native fishing appliances will be in charge of the fishery expert.

The Smithsonian Institution has specially requested that the Fish Commission make an effort to trace the origin of some of