Eliot on Nudibranchiata, by Mr. L. A. Borradaile on the sponge-crabs, and by Sir John Murray, F.R.S., and the editor on lagoon deposits.

THE *Proceedings* of the Washington Academy of Sciences for July 18 is made up of a full account of a meeting held in Columbia University, under the auspices of the Washington Academy, to commemorate the distinguished services to knowledge of the late Major John Wesley Powell, together with a list of the 251 papers and articles written by him during the years 1867 to 1903. Major Powell's work as director of the Bureau of American Ethnology is well known to anthropologists, and his services to science as an explorer, geologist and organiser are of the same high value. As an observer in many fields of natural science, and as one who exerted great influence on scientific progress, Major Powell's memory will long be held in honour.

MESSRS. CHARLES GRIFFIN AND CO., LTD., have now published a tenth edition of Mr. Bennett H. Brough's "Treatise of Mine-Surveying." The book was first published in 1888, and was reviewed at length in our issue of August 2 of that year. The prediction made on that occasion—"as soon as the book becomes known, no English-speaking mine-agent or mining student will consider his technical library complete without it"—has been fully justified, as the issue of a tenth and revised edition shows. Descriptions of appliances invented since the ninth edition appeared at the beginning of last year have now been inserted in the book, and among these additions will be found accounts of Sir Howard Grubb's new sight for mining dials, of Gothan's instrument for surveying bore-holes, and of the Dunbar-Scott mine tacheometer. Besides these improvements, references to important papers lately published and recent examinations questions have been added.

THE current number of the *Popular Scientific Monthly*, in addition to other articles of general scientific interest, reprints the Romanes lecture delivered last June by Sir Oliver Lodge, F.R.S., and publishes the third of a series of papers on Hertzian wave wireless telegraphy by Prof. J. A. Fleming, F.R.S. Other papers are on the bird rookeries on the island of Laysan, and bacteria in modern economic agriculture. From the columns headed the progress of science we learn there are now somewhat more than 100,000 students in the colleges, universities, and technical schools of the United States, and somewhat more than 50,000 in the professional schools of theology, law and medicine. In 1901, 16,513 students graduated from colleges and technical schools, and of these 5050 were women. The number of pupils in secondary schools was in 1901 upwards of 600,000, as compared with less than 100,000 in 1878.

THE additions to the Zoological Society's Gardens during the past week include a Vervet Monkey (*Cercopithecus lalandii*) from South Africa, presented by Mr. — Townshend; two Malayan Bears (*Ursus malayanus*) from Malacca, presented by the Right Hon. Earl of Crawford; two Norwegian Lemmings (*Myodes lemmus*) from Norway, presented by Major-General C. S. Sturt; two Dwarf Chameleons (*Chamaeleon pumilus*) from South Africa, presented by Mrs. Mainwaring; four Tuberculated Iguanas (*Iguana tuberculata*) from Venezuela, three Elephantine Tortoises (*Testudo elephantina*) from the Aldabra Islands, two Radiated Tortoises (*Testudo radiata*) from Madagascar, deposited; a Japanese Deer (*Cervus sika*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

BORRELLY'S COMET (1903 *c*).—The following elements and ephemeris for Borrelly's comet have been computed by Dr. Aitken, of the Lick Observatory, from observations made on June 22 and 30, and July 10 (Lick Observatory *Bulletin*, No 47):—

Elements.

T = 1903 August 27·6056 G.M.T.

ω = 127° 19′ 25″·5
Ω = 293 32 55·0 } 1903·0
i = 84 59 45·3
log q = 9·518126

Ephemeris 12h. G.M.T.

1903	True α	True δ	log Δ	Brightness
	h. m. s.	° ′		
Aug. 13·5	10 54 23	+39 24·1	—	—
,, 15·5	10 48 12	+37 42·9	9·947	6·7
,, 17·5	10 42 2	+35 58·0	—	—
,, 19·5	10 35 58	+34 7·2	9·996	7·4
,, 21·5	10 29 54	+32 7·0	—	—
,, 23·5	10 24 3	+29 54·8	0·038	8·2
,, 25·5	10 18 30	+27 27·0	—	—
,, 27·5	10 13 31	+24 47·3	0·074	7·9
,, 29·5	10 9 20	+21 54·6	—	—
,, 31·5	10 5 59	+18 53·8	0·100	6·2

PROJECTION ON MARS.—In the first *Bulletin* issued by the Lowell Observatory, Flagstaff, Arizona, Mr. Percival Lowell describes the observations of a projection which was discovered on the terminator of Mars by Mr. Slipher at 15h. 34m. (G.M.T.) on May 25. Messrs. Lowell and Slipher afterwards alternately observed the projection, which lasted for about thirty-one minutes; the position angle varied from 204°·0 to 199°·8, and the projection was variously estimated as being removed from the terminator by a perpendicular distance of 0·067–0·075 of the radius of the disc; its length was 1″·58, and it disappeared at 16h. 8m.

The projection was "suspected" again at 15h. 58m. on May 27, and, if really seen, had moved 7° in latitude and 8° in longitude during the twenty-four hours' interval. The observations lead to the conclusion that the projection was probably a cloud of *dust* about 300 miles long, travelling at about 16 miles an hour in a north-easterly direction, and dissipating as it went.

THE SATELLITE OF NEPTUNE.—Using the Crossley reflector, Prof. Perrine has obtained a series of photographs of Neptune's satellite which cover one complete revolution, January 4–January 16, 1902.

The measurements of forty-five plates show that a correction of +0°·55, with a probable error of ±0°·09 in position angle, and of −0″·006, with a probable error of ±0″·020 in distance, must be applied to Hall's elements as published in No. 441 of the *Astronomical Journal*.

The observations are recorded in *Bulletin* No. 39 of the Lick Observatory, which also contains a series of determinations of the position of the planet itself, at certain times, as determined from the same photographs.

THE ESTIMATION OF STELLAR TEMPERATURES.—The question of the relative temperatures of the different types of stars is one of the most important in astrophysics, and has lately been the subject of much discussion in consequence of the discovery that spark lines appear in the arc spectrum under certain special conditions. In *Astr. Nach.* (No. 3882), after reviewing the recent contributions to the discussion, Prof. Kayser suggests a method of estimating the temperatures of stars which is based on an idea put forward in 1876 by Sir George Stokes in a note appended to a paper by Sir Norman Lockyer (Roy. Soc. *Proc.*, vol. xxiv. pp. 352–4). In the case of an incandescent solid body the proportion of the more refrangible radiations increases with the temperature, and Stokes suggested that a line spectrum might behave in the same manner, so that at different temperatures different lines would be most persistent. Prof. Kayser thinks that, while this may not hold for the whole spectrum, it may be true for the lines of a definite series, such as those of hydrogen, or one of the series of lines of helium. On this supposition he has recently undertaken a preliminary investigation for the

detection of such variations in the spectra of hydrogen, helium, and lithium, and has obtained indications that the energy of the shorter waves is relatively increased with increase of temperature, assuming that the temperature in Geissler tubes rises with increased potential and current strength. It is considered probable that further laboratory experiments combined with photometric or photographic estimates of the intensities of the stellar lines may result in a fairly accurate knowledge of the temperatures of some of the stars; great progress will have been made if the temperatures can only be ascertained within one or two thousand degrees.

OBSERVATIONS OF THE MINIMA OF MIRA.—In No. 3888 of the *Astronomische Nachrichten*, Prof. A. A. Nijland records his observations of the last minimum of Mira, which took place during December. Plotting his observations on a curve, he found that the actual minimum occurred on December 17, 353 days after the minimum of December 29, 1901, the magnitude on that date being 8·70 on the Harvard photometer scale.

The following table shows the differences between the dates of minima as predicted by Guthnick (*Astronomische Nachrichten*, No. 3745) and those actually observed :—

Observed		Guthnick		O-G
1901 Feb. 16	...	1901 March 6	..	−18 days
,, Dec. 29	...	1902 Jan. 31	...	−33 ,,
1902 ,, 17	...	,, Dec. 28	...	−11 ,,

THE SIZE OF STELLAR SYSTEMS.—In an editorial article in the *Observatory* for August, a table is given which compares the dimensions of various stellar systems with those obtaining in the solar system. As the writer states, these are not generally known or not remembered, therefore he has tabulated a few of the more interesting and approximately known data, which must, however, only be taken as approximations owing to the uncertainty of the original data from which they are computed.

Object	Separation of components		Motion across the line of sight, in millions of miles per annum
—	In astronomical units	In millions of miles	—
Earth	1·0	93	—
Saturn	9·5	883	—
Procyon	17·3	1,608	372
Uranus	19·2	1,782	—
Sirius	21·1	1,962	316
α Centauri	23·3	2,167	465
Castor	27·5	2,557	140
Neptune	30·1	2,792	—
o_2 Eridani (B and C)	34·5	3,207	2,000
η Cassiopeiæ	44·7	3,947	580
θ Ursæ Maj.	63·0	5,860	1,300
61 Cygni	68·0	6,324	1,116
Polaris	250	23,250	133
Aldebaran	282	26,226	170
θ_2 Eridani (A and B)	455	42,315	2,000

RECENTLY DETERMINED STELLAR PARALLAXES.—No. 10 of the *Publications* of the Groningen Astronomical Laboratory contains the details of the observations and reductions of parallax for the stars and clusters "*h* and χ Persei," "745 Groombridge," and "61 Cygni and the surrounding stars." The photographs from which the parallactic values were determined were obtained by Prof. A. Donner, and have been reduced by Prof. J. C. Kapteyn and Dr. W. de Sitter.

In the summary given for the cluster *h* and χ Persei, 178 stars are included, and it will be possible, when it has been decided, from observations of their proper motions, whether or not the individual stars actually belong to the cluster, to determine the parallax of this cluster with extreme accuracy.

The parallax of 745 Groombridge relative to stars of the mean magnitude 9·0 was found to be $+0''·083 \pm 0''·024$, and on consideration of the star's magnitude (8·2) and its annual proper motion ($0''·64$), $+0''·068$ was accepted as the most probable value of this parallax.

The final value of the parallax of 61 Cygni relative to the four comparison stars (mean magnitude =7·4) is given as $+0''·326 \pm 0''·035$; the plates from which this result was obtained do not confirm the existence of any real difference of parallax between the two components.

No. 11 of the same *Publications* contains a discussion on "The Luminosity of the Fixed Stars" by Prof. J. C. Kapteyn.

EXPERIMENTS IN RADIO-ACTIVITY, AND THE PRODUCTION OF HELIUM FROM RADIUM.[1]

(1) *Experiments on the Radio-activity of the Inert Gases of the Atmosphere.*

OF recent years many investigations have been made by Elster and Geitel, Wilson, Strutt, Rutherford, Cooke, Allen, and others on the spontaneous ionisation of the gases of the atmosphere and on the excited radio-activity obtainable from it. It became of interest to ascertain whether the inert monatomic gases of the atmosphere bear any share in these phenomena. For this purpose a small electroscope contained in a glass tube of about 20 c.c. capacity, covered in the interior with tin-foil, was employed. After charging, the apparatus if exhausted retained its charge for thirty-six hours without diminution. Admission of air caused a slow discharge. In similar experiments with helium, neon, argon, krypton, and xenon, the last mixed with oxygen, the rate of discharge was proportional to the density and pressure of the gas. This shows that the gases have no special radio-activity of their own, and accords with the explanation already advanced by these investigators that the discharging power of the air is caused by extraneous radio-activity.

Experiments were also made with the dregs left after liquefied air had nearly entirely evaporated, and again with the same result; no increase in discharging power is produced by concentration of a possible radio-active constituent of the atmosphere.

(2) *Experiments on the Nature of the Radio-active Emanation from Radium.*

The word emanation originally used by Boyle ("substantial emanations from the celestial bodies") was resuscitated by Rutherford to designate definite substances of a gaseous nature continuously produced from other substances. The term was also used by Russell ("emanation from hydrogen peroxide") in much the same sense. If the adjective "radio-active" be added, the phenomenon of Rutherford is distinguished from the phenomena observed by Russell. In this section we are dealing with the emanation, or radio-active gas obtained from radium. Rutherford and Soddy investigated the chemical nature of the thorium emanation (*Phil. Mag.*, 1902, p. 580) and of the radium emanation (*ibid.*, 1903, p. 457), and came to the conclusion that these emanations are inert gases which withstand the action of reagents in a manner hitherto unobserved except with the members of the argon family. This conclusion was arrived at because the emanations from thorium and radium could be passed without alteration over platinum and palladium black, chromate of lead, zinc dust, and magnesium powder, all at a red-heat.

We have since found that the radium emanation withstands prolonged sparking with oxygen over alkali, and also, during several hours, the action of a heated mixture of magnesium powder and lime. The discharging power was maintained unaltered after this treatment, and inasmuch as a considerable amount of radium was employed it was possible to use the self-luminosity of the gas as an optical demonstration of its persistence.

In an experiment in which the emanation mixed with oxygen had been sparked for several hours over alkali, a minute fraction of the total mixture was found to discharge an electroscope almost instantly. From the main quantity

[1] By Sir William Ramsay, K.C.B., F.R.S., and Mr. Frederick Soddy. Received at the Royal Scciety July 28.