the *Cyanide* commences with an excellent conspectus of the genera of that family, followed by detailed descriptions of both genera and species; two well-executed uncoloured plates accompany the paper.

In the third memoir Dr. T. Thorell gives an account of the *Araneæ* collected in Colorado in 1875 by Dr. Packard; the descriptions of the species are drawn up in the author's usual careful and exhaustive style, and leave nothing to be desired but illustrations, the absence of which we cannot but deplore; an appendix by Mr. J. H. Emerton (the well-known American arachnologist) describes two additional species of the genera *Epeira* and *Drassus*, with which two woodcuts are given.

A. G. BUTLER

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Temperature of Moon's Surface

In a recent number of *Les Mondes* (tome xlv., No. 1, September 6, 1877), M. l'Abbé F. Raillard puts forward a theory to explain the reddish tinge acquired by the moon during a total eclipse, attributing it possibly to the great elevation of temperature caused by the continuous exposure of its surface for many days previous to the solar rays, which he thinks may be adequate so to raise its temperature as to render it self-luminous.

In support of his theory he refers to my experiments with the thermopile, and states that I have found the lunar surface to acquire under solar radiation a temperature of more than 500° Centigrade. Now in a paper published in the *Proceedings* of the Royal Society, No. 112 (1869), I estimated the radiation to be equal to that of a lamp-blackened surface 500° Fahrenheit higher in temperature at full moon than at new moon, but on repeating the experiments¹ with more care, 197° Fahrenheit, or 100° Centigrade, was found to be a far more probable value, a large error having crept into the former result. It is, moreover, shown in my last paper that near the middle of the partial eclipse of 1872, Nov. 14, the radiant heat was only about one-half of what it had been two hours before, having kept pace in its diminution with the light. Observations made during the recent eclipse, so far as they go, fully confirm this result, and I much doubt if five per cent. of the heat acquired since new moon is retained till the middle of a total eclipse; heat, too, which we have shown from its low mean refrangibility as compared with that of the direct heat of the sun to have been truly absorbed by the lunar surface.

M. l'Abbé Raillard appears to be mistaken in supposing it to be the generally received theory that the red tinge is due to dispersion rather than to simple refraction and preponderant absorption of the more refrangible rays in passing through the earth's atmosphere.

There appears to be, therefore, no ground for supposing that the difference between the "lumière cendrée" of the unilluminated surface of the new moon and its reddish hue during a total eclipse is to be ascribed to a difference of temperature, and I think that we must fall back on the usual explanation.

It may also be expected that independently of any tinge due to unequal absorption by the earth's atmosphere the preponderance of blue and green on the terrestrial surface may not be without influence on the colour of the "earth-light" which gives rise to the "lumière cendrée" and may contribute to an appreciable degree towards forming a contrast between its hue and that acquired by the moon when totally eclipsed.

September 15

ROSSE

Rainfall and Sun-Spots in India

As Prof. Balfour Stewart says the true test of a physical cycle is its repetition, and since he evidently regards the tendency to repetition which he has shown to exist in the rainfall of Madras

¹ *Philosophical Transactions*, 1873.

as a favourable indication of the presence of a physical cycle such as that claimed by Dr. Hunter, I may perhaps be allowed to supplement my former statements regarding the tendency of the winter rainfall in many stations of Upper India to vary in a cycle corresponding inversely with the solar spots, by exhibiting a similar tendency to repetition in the rainfall of Calcutta. The following table represents the winter rainfall of Calcutta from 1833 to 1876.

The rainfall is taken for the months of January, February, March, and April in each year, together with that for December of the preceding year. The November fall is excluded chiefly because experience and an inspection of the register show that it properly belongs to the summer monsoon rainfall, occurring almost entirely in those years in which the summer monsoon rains are either very heavy or prolonged, and in fact being nothing else than the last drop they shed before they take their departure. The real winter rains commence in the Christmas week, so December really includes their actual first appearance. As the summer rains seldom begin before the second week in June, we are well within correct limits in taking the rainfall from December to April inclusive. The following table is arranged after the model of that given by Prof. Stewart in his letter to *NATURE* (vol. xvi. p. 161) :—

Years em- ployed.	Years of Series—Calcutta.											
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	
1833-43	4'34	7'34	3'12	2'97	2'16	1'98	3'19	1'24	5'11	7'49	6'69	A.
1844-54	4'51	9'21	6'30	3'85	1'77	6'75	5'79	7'28	9'50	1'60	9'54	B.
1855-65	5'54	3'91	2'76	1'80	7'26	2'56	1'75	5'51	3'83	3'42	8'58	C.
1866-76	7'46	3'21	5'86	8'41	4'83	6'47	5'08	3'02	8'68	5'45	7'49	D.
Whole period average.	5'46	5'91	4'51	4'25	4'00	4'44	3'95	4'26	6'78	4'49	8'07	

The years of minimum sun-spot occur in the first and second series, and the years of maximum sun-spot in the fifth and sixth series. The series of heaviest average winter rainfall are 9, 10, 11, 1, 2, and those of lightest average rainfall are 5, 6, 7, 8. Taking the mean of the averages of the five series of heaviest rainfall we get 6'14 inches, and taking the mean of the averages of the four series of lightest rainfall the result is 4'16 inches. The same result is exhibited by each cycle individually, thus :—

		Max. group, inches.		Min. group, inches.
Cycle A	...	6'19	...	2'14
" B	...	6'87	...	4'31
" C	...	5'05	...	4'27
" D	...	6'45	...	4'85

The evidence of repetition is thus quite as manifest as in Dr. Hunter's case, the only difference being that in the present case the years of minimum sun-spot are those of heaviest, and maximum sun-spot those of lightest, rainfall. In order to render it still more apparent that the cyclical connection with the sun-spots is not the result of accident I will exhibit the difference between the rainfalls in years of absolute minimum and maximum sun-spot :—

Years of minimum sun-spot.	Total of the five months.	Years of maximum sun-spot.	Total of the five months.
1834 } 1844 } 1856 } 1867 }	inches. 18'97	1837 } 1848 } 1860 } 1870 }	inches. 11'32
Average for each year }	4'74	Average for each year }	2'83

The same connection is maintained when the fall in April is left out or that in November included, so that it is evidently not due to the effect of any particular month, but as may reasonably