faculæ were observed on 56 days, viz. 19 in January, 19 in February, and 18 in March. The results are shown below :—

1892,	Relative frequency of spots.	Relative frequency of days without spots.	Relative magnitude of spots.	Relative magnitude of faculæ.
January ...	19·63	0·00	79·79	56·58
February ...	23·31	0·00	153·61	60·28
March ...	13·12	0·00	61·67	86·39

The following are the results for prominences :—

1892.	Days of observation.	Mean number.	Mean height.	Mean extension.
			"	°
January	13	6·39	39·6	1·6
February	13	7·00	36·0	1·6
March...	14	8·14	36·4	2·3

The frequency and magnitude of spots during these months are much greater than during the preceding quarter, but prominences do not show a marked increase. No augmentation of this class of phenomena appears to have accompanied the great spot of February, if the mean numbers for the month be taken.

ECLIPSE OF THE MOON, MAY 11.—A partial eclipse of the moon will occur on May 11, and, if weather permits, it should be widely observed. The magnitude of the eclipse is 0·953, the moon's diameter being represented by 1. But although it is not total, important naked-eye observations can be made on the darkness of the shadowed moon for comparison with previous eclipses, and possessors of telescopes will doubtless take advantage of the occasion to obtain some new facts. The following times are from the "Nautical Almanac" :—

	G.M.T. h. m.
First contact with the penumbra, May 11	7 55·9
,, ,, ,, shadow ,,	9 10·2
Middle of the eclipse ,,	10 53·4
Last contact with the shadow ,,	12 36·6
,, ,, ,, penumbra ,,	13 50·9

The first contact with the shadow occurs at 82° from the most northern point of the moon's limb, counting towards the east ; the last contact at 41° from the same point, counting towards the west.

SPECTRUM OF SWIFT'S COMET (*a* 1892).—Mr. W. W. Campbell observed the spectrum of Swift's comet on April 6, by means of a spectroscope having one prism of 60° attached to the 36-inch of the Lick Observatory (*Astronomical Journal*, No. 262). The spectrum could be distinguished from about C to G. Three bright bands had the wave-lengths of their less refrangible edges determined as 5630, 5170·4, and 4723, by comparison with spark-spectra of iron and magnesium. The intensities of the bands were estimated to be in the ratio 1 : 6 : 2.

COMET SWIFT, 1892. — *Astronomische Nachrichten*, No. 3087, contains the following ephemeris of Swift's comet :—

For 12h. Berlin Mean Time.

1892.	R.A. h. m. s.	Decl. ° ′	log *r*.	log Δ.	B.
May 5	22 45 25	+23 41·7			
,, 6	22 48 19	24 21·5			
,, 7	22 51 12	25 0·5	0·0608	0·1115	0·70
,, 8	22 54 3	25 38·7			
,, 9	22 56 53	26 16·2			
,, 10	22 59 41	26 52·9			
,, 11	23 2 28	27 28·9	0·0723	0·1236	0·62

The brightness on March 10 is taken as unity.

On the 5th the comet will be found to form very nearly an equilateral triangle with the stars λ and μ in Pegasus, while on the 11th it will be near β in the same constellation.

COMET SWIFT, 1892.—The spectrum of this comet has been observed by Prof. Konkoly, who contributes his observations to the *Astronomische Nachrichten*, No. 3087. The spectrum on April 1 appeared very bright, and showed five bright lines whose intensities were as follows :—I. = 0·4 ; II. = 0·3 ; III. = 1·0 ; IV. = 0·2 ; V. = 0·1, the continuous spectrum extending from λ = 580 to λ = 440.

The following measures are the means of five direct scale readings of the above-mentioned lines :—

I. = 558·82 μμ
II. = 544·94
III. = 516·30
IV. = 472·54
V. = 468·78

Similar observations were also repeated the next night, only by means of a larger telescope and spectroscope. The continuous spectrum was found to extend from λ = 559 μμ to λ = 449 μμ. The intensities were I. = 0·5 ; II. = 0·3 ; III. = 1·0 ; IV. = 0·2 ; V. = 0·1.

The mean values of the five measures obtained for each line were :—

I. = 558·40 μμ
II. = 543·82
III. = 516·26
IV. = 472·70
V. = 468·10

NOVA AURIGÆ.—*Astronomische Nachrichten*, No. 3083, contains some measurements and remarks by Prof. Konkoly relative to the spectrum of this Nova. Five lines were, according to him, very satisfactorily measured on March 20, and the means of six measures for each were as follows :—

I. = 531·80 μμ
II. = 516·50
III. = 501·95
IV. = 492·30
V. = 486·15

Using a 10-inch objective prism on the 21st, he found that II. was the brightest line, III. being somewhat feebler ; I. was very weak, while IV. was not bright, but broad ; V., again, seemed quite visible. With regard to the dark lines, he was only able to suspect them in the region of C and F (especially the latter), owing to their feebleness. The hydrogen lines on the 21st appeared feebler than those in γ Cassiopeiæ.

A NEW VARIABLE.—A circular (No. 32) that we have received from the Wolsingham Observatory contains the following :—

The star D.M. + 55° 1870—

16h. 39m. 49s. ; +55° 12′ ; 9·2

was found 7·3 ; 7·7, April 26 ; 29. Variable. Spectrum like Mira.

T. E. ESPIN.

THE TEMPERATURE OF THE BRAIN.

THE Croonian Lecture was delivered this year by Prof. Angelo Mosso, Professor of Physiology in the University of Turin. His subject was the temperature of the brain, especially in relation to psychical activity. Prof. Mosso's earlier investigations on the human brain only related to the blood circulation.[1] He then found that the blood pressure rises during psychical work, and that during such more blood is sent from the peripheral parts of the body. Prof. Mosso also found that the blood circulation in the brain showed fluctuations which are not dependent on psychical activity. These and other variations in the brain circulation led him to suspect that Dr. Schiff's theory about brain temperature as introduced into physiology required revision. In a published work on fatigue,[2] Prof. Mosso gave his views on the influence of psychical work on the organism, especially on the muscular force. We do not yet know what form of phenomena subserves the first condition of thought. Fatigue caused by psychical activity acts as a poison, which affects all organs, but especially the muscular system. This is clearly demonstrated by Prof. Mosso's investigations on men who have been subjected to great mental strain. The blood of dogs, fatigued by long racing, acts as a poison, and when injected into other dogs they exhibit all the symptoms of fatigue. The characteristic phenomena of fatigue depend more on nerve-cell products than on a deficiency of suitable material.

During investigation into the physical conditions during psychical activity, Prof. Mosso's attention was directed to the subject of the temperature of the brain. To avoid errors arising from blood changes he endeavoured to keep the blood temperature and that of the organs in agreement with that of the brain. For such a purpose he found that the thermo-electric pile which Dr. Schiff employed would not suffice, and he had

[1] "Kreislauf des Blutes in menschlichen gehirne," Leipzig, 1881.
[2] "Die Ermudung," Leipzig, 1892.

therefore made by Baudin, of Paris, some very sensitive mercurial thermometers. The investigations made with the help of these instruments on the brain and blood temperatures bring to light new evidences of activity in the nerve centres. There are sometimes very extensive temperature developments under the influence of special excitements quite independent of psychical activity. The change in the nutrition of the nerve-cells, and not their specific activity, seems to be the most important source of heat in the brain. Thus Prof. Mosso would explain the marked effect on brain temperature of ordinary irritants where the increase is far higher upon the introduction of such than upon any psychical work done by the brain.

The following is an abstract of Prof. Mosso's Croonian Lecture :—

In his investigations on the temperature of the brain the author has employed, in preference to the thermo-electric pile, exceedingly sensitive mercurial thermometers, constructed specially for the purpose. Since each thermometer contains only four grams of mercury, the instruments respond very rapidly to changes of temperature, and a change of not more than 0°·002 C. can easily be measured by means of them. The author has studied the temperature of the brain, comparing it with that of arterial blood, of the muscles, and of the interior of the body. His observations were made on animals under the influence of morphia or various anæsthetics, and also on man.

The curves of the observations made show that in profound sleep a noise, or other sensory stimulus, is sufficient to produce a slight development of heat in the brain, without the animal necessarily awakening.

In profound sleep the temperature of the brain may fall below that of the blood in the arteries. This is due to the very great radiation of heat which takes place from the surface of the head.

The brain when subjected to the action of the ordinary interrupted current rises in temperature. The rise is observed earlier in the brain than in the blood, and the increase is greater in the brain than in the general blood-current or in the rectum. During an epileptic seizure, brought on by electrical stimulation of the cerebral cortex, the author observed within twelve minutes a rise of 1° C. in the temperature of the brain.

As a rule the temperature of the brain is lower than that of the interior of the body; but intense psychical processes, or the action of exciting chemical substances, may cause so much heat to be set free in the brain that its temperature may remain for some time 0°·2 or 0°·3 C. above that of the interior of the body.

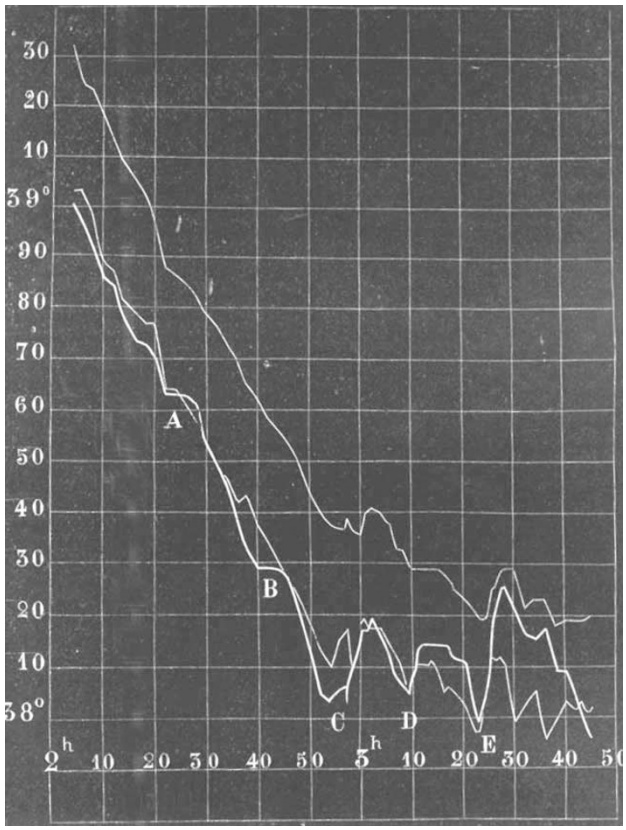

FIG. 1. Dog rendered insensible with laudanum. The upper (thin) line represents the temperature of the interior of the body, the middle (thin line the temperature of the blood in the carotid artery, the third (thick) line the temperature of the brain. A, injection of 3 c.c. laudanum; B, blast of a trumpet; C, D, E, electric stimulation of the brain. The ordinate is marked in tenths of a degree Centigrade, the abscissa in periods of ten minutes.

When a dog is placed under the influence of curare, the temperature of the brain remains fairly high, while that of the muscles and that of the blood falls. The difference of temperature thus brought about is great and constant. In one instance, the temperature of the brain was 1°·6 C. above that of the arterial blood in the aorta. Such observations warn us not to regard the muscles as forming, *par excellence*, the thermogenic tissue of the body.

In order to show how active are the chemical processes in the brain, it is sufficient to keep the animal in a medium whose temperature is the same as that of the blood. When the effects of radiation through the skull are thus obviated, the temperature of the brain is always higher than that of the interior of the body, the difference amounting to 0°·5 or 0°·6 C.

Observations made while an animal is awake tend to show that the development of heat due to cerebral metabolism may be very considerable, even in the absence of all intense psychical activity. The mere maintenance of consciousness belonging to the wakeful state involves very considerable chemical action.

The variations of temperature, however, observed in the brain, as the result of attention, or of pain or other sensations, are exceedingly small. The greatest rise of temperature observed to follow, in the dog, upon great psychical activity was not more than 0°·01 C. When an animal is conscious, no change of consciousness, no psychical activity, however brought about experimentally, produces more than a slight effect on the temperature of the brain.

The author shows an experiment by which it is seen that, as part of the effect of opium, the brain is the first organ to fall in temperature, and that it may continue to fall for the space of eighteen minutes, while the blood and the vagina are still rising in temperature.

The author discusses the elective action of narcotics and anæsthetics. He shows that these drugs suspend the chemical functions of the nerve-cells. In a dog rendered completely insensible by an anæsthetic, one no longer obtains a rise of temperature upon stimulating the cerebral cortex with an electric current. These results cannot be explained as merely due to the changes in the circulation of the blood. The physical basis of psychical processes is probably of the nature of chemical action.

In another experiment, in an animal rendered insensible with chloral, the curves of temperature show that when the muscles of a limb are made to contract, the temperature of the muscles rises, but falls rapidly as soon as the stimulation ceases, soon returning to the normal. This is not the case, however, with the brain excited by an electric current. Here the stimulus gives rise to a more lasting production of heat; the temperature may continue to increase for several minutes after the cessation of the stimulation, indeed, often for half an hour. This may possibly explain why, upon an electric stimulation of the cerebral cortex, the epileptiform convulsions are not immediately developed, but only appear after the lapse of a latent period of several minutes.

This experiment may be made to show the elective action exercised upon the brain by stimulant remedies. The injection of 10 centigrams of cocaine hydrochlorate produces a rise of

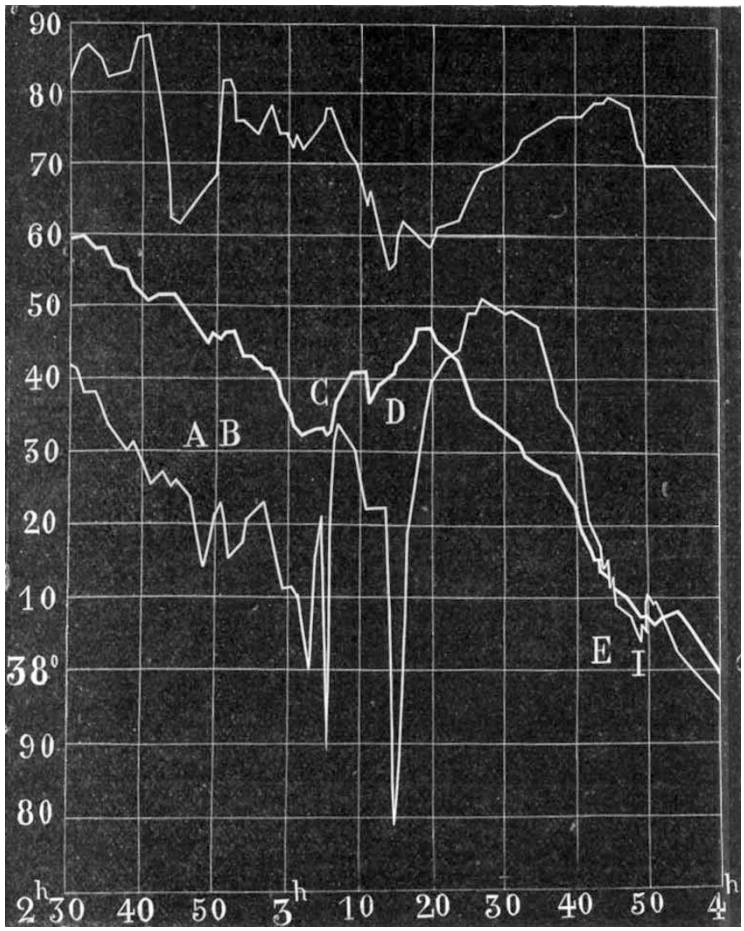

FIG. 2.—Dog (female) rendered insensible with chloroform and then with laudanum. The upper line represents the temperature of the vagina, the middle (thicker) line that of the brain, the lower that of the arterial blood in the carotid artery. A and B, psychical emotion; C, electric stimulation of the brain; D, injection of 14 c.c. laudanum (intravenous); E and I, electric stimulation of the brain.

temperature in the brain of 0°·36 C., without any change in the temperature of the muscles or of the rectum being observed. In a curarised dog, the intervention of the muscles being thereby excluded, the action of the cocaine may produce a rise of as much as 4° C. in the temperature of the brain, the author having observed a rise from 37° to 41° C. This shows that in arranging the calorific topography of the organism a high place must be assigned to the brain.

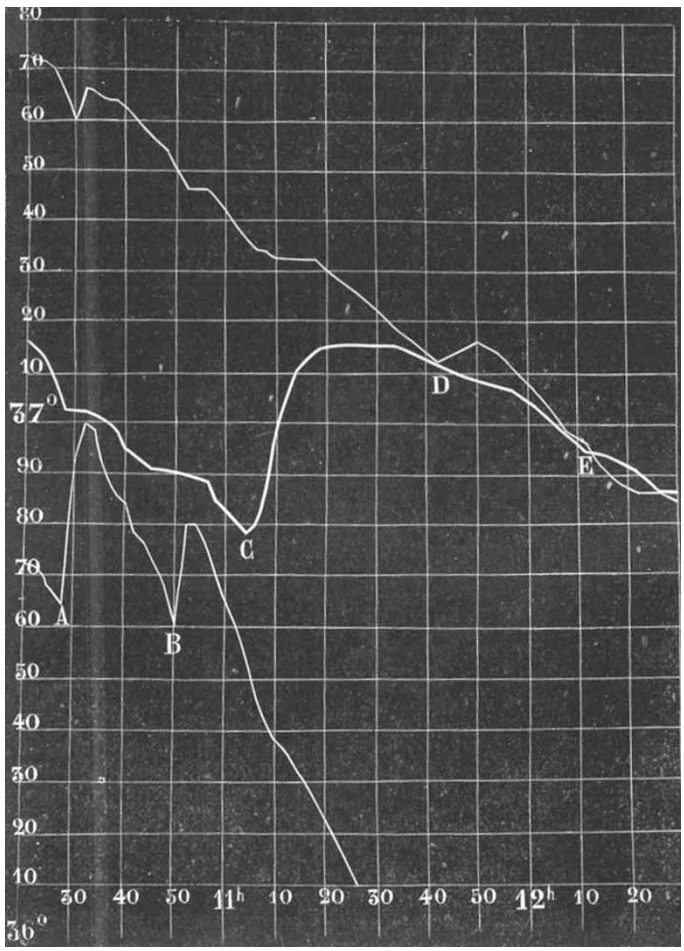

FIG. 3.—Dog rendered insensible with chloral. The upper line represents the temperature of the rectum, the middle (thicker) line that of the brain, the lower line that of the muscles of the thigh. A and B, electric stimulation of the muscles; C, injection of 10 centigrams of cocaine int the saphena vein; D, E, spontaneous variations in the temperature of the rectum.

THE MAGNETIC STORM OF FEBRUARY IN MAURITIUS.

AT a meeting of the Meteorological Society of Mauritius, that took place on April 7, Mr. Meldrum read a short paper on the sun-spots, magnetic storm, cyclones, and rainfall of February 1892. The photographs of the sun that he exhibited, which were taken at the Royal Alfred Observatory from February 5 to 18, showed the very large group of spots, their approximate latitude on the 9th being from 6° to 16° south. Leading on to the occurrence of the great magnetic storm which began at 8h. 55m. on the 13th, he states that its commencement was distinctly recorded on the three curves, the horizontal force suffering the greatest disturbance. Up to 14h. the magnet was in oscillation, the force increasing, and reaching a maximum at 13h. 43m., after which it began to decrease, the minimum being reached at 0h. 15m. on the 14th. Further abrupt movements occurred at 4h. 30m. on the 14th, the oscillations, as shown by the curves, being very numerous, but at 19h. the magnets became more steady, and were quiet by 3h. on the 15th. The ranges obtained at the Mauritius Observatory were the largest ever recorded there.

Cyclones were not absent during this month. One lasted from the 11th to the 14th, and another from the 25th to the 28th, while a third was also experienced on the 21st and 22nd, about 550 miles south of Mauritius. The rainfall for February, as shown by returns from the numerous stations, was from 4·30 to 16·96 inches above the average for periods of 7 to 29 years. At Antoinette the fall for the month amounted to 12·53 inches, while that at Cluny came to 34·37 inches. St. Aubin and Nouvelle France came in for a considerable quantity of rain, the falls in the 24 hours ending at 8 a.m. on the 13th reaching the figures 5·00 and 18·20 inches respectively. Referring lastly to the magnificent displays of auroræ that have been observed both in Europe and America, he mentions that, although at Mauritius the sky was overcast, under similar conditions with respect to solar activity and terrestrial magnetism, a great display was visible in 1872. Mr. Meldrum,