

Clausius, than whom none could be a more unprejudiced witness. "At the same time in the theoretical development of the mechanical theory of heat, in which the relation between heat and work often occurs, the method of expressing heat in mechanical units effects such important simplifications that the author has felt himself bound to drop his former objections to the method on the occasion of the present more connected exposition of that theory." ARCHD. C. ELLIOTT

Edinburgh, April 18

Seismometers

I HAVE long ago learnt not to look for any fair recognition of my work in seismometry on the part of Prof. John Milne, and when he accuses me of appropriating without acknowledgment the work of others it is time to decline further controversy with him. The points raised in his last communication (NATURE, April 14, p. 559) are sufficiently answered in mine of December 11 (p. 172). I there quoted part of a letter written by Prof. Chaplin, now of Harvard University, then of Tokio, and Secretary of the Seismological Society of Japan, under whose eyes the events occurred to which Prof. Milne refers. I did not quote the whole of Prof. Chaplin's letter, because it contained sentences I was unwilling to give except under the strongest provocation. After referring to my seismograph in the words already quoted (p. 172), Prof. Chaplin continues:—

"I do not remember that in the discussions on your machine Mr. Gray ever claimed to have invented a similar machine, and I am surprised to know that he makes that claim now. On this and other points it appears to me that Messrs. Gray and Milne have not treated your inventions and investigations with fairness, and that you have just grounds for complaint. I am willing you should make such use of this note as you see fit."

As to the question of priority, this judgment, from a man at once unprejudiced, most competent to form an opinion, and fully informed of the matter in dispute, must (so far as I am concerned) close a discussion of which your readers cannot but be weary. With your permission I shall give, in a later number of NATURE, an example of the excellent work which Prof. Sekiya is now doing with my instruments in Japan.

J. A. EWING

University College, Dundee, April 16

April Meteors

THE Lyrids have, this year, offered a somewhat scanty display, though a few brilliant meteors have been seen shooting from the usual radiant-point.

In 1884 April 19, this shower was very rich, the horary number of its meteors for one observer being about 22, but in the following year, 1885, it exhibited a considerable decline, the hourly rate being only 3. In 1886 I obtained no observations, owing to the bright moonlight and in the present year, on April 20, the horary number was slightly more than 2, so that the numerical character of the recent display has fallen far short of some of its apparitions in preceding years.

On the night of April 17, this year, the shower had not visibly opened, for none of its meteors were recorded in a 2½ hours' watch. On each of the nights of the 18th and 19th the sky was closely observed for 4½ hours, but the Lyrid shower was very feeble, and only furnished 1 meteor per hour. On the 20th, in 3 hours I noted 7 Lyrids, and these were brilliant.

The average radiant-point from the three nights was at $269^\circ + 32^\circ$, and there is confirmation that this point advances in R.A. with the time, though not to the marked degree ascribed in NATURE for May 7, 1885, p. 5. But the meteors from this stream have been so scarce at their late recurrence that it has been very difficult to ascertain the exact radiant for each night. Moreover, these Lyrids move with great apparent velocity, flashing out with extreme suddenness and they are gone, together with the faint streaks sometimes accompanying them, before the eye is enabled to catch the directions with satisfactory precision.

On the four nights April 17 to 20 inclusive, I noticed 70 shooting-stars belonging to the minor systems of the Lyrid meteoric epoch, and amongst these the best was that of a radiant of very swift, short meteors at $231^\circ + 17^\circ$, a few degrees west of β Serpentis. This stream is not new, for I saw a well-defined shower of Serpentids from the same point during my observa-

tions of the Lyrids in 1885, on April 19–20 (NATURE, May 7, 1885, p. 6).

In this and in previous years I have also recorded some meteors ascending in very long flights from a radiant centre close to θ Libræ, at $235^\circ - 15^\circ$. This is the only observation of this shower at the April period, though Lieut.-Colonel Tupman found a pair of radiants near the position assigned in the first week of March 1869–70.

I subjoin a short list of bright meteors seen here while watching the progress of the Lyrids, and I should be glad to hear that any of these had been observed elsewhere.

Date	Hour	Mag.	Apparent Path		Notes	Radiant
			From	To		
1887	h. m.					
April 19	13 13	0	$269 + 11$	$269 + 1$	Swift, streak	Lyrid
19	13 46	$\frac{1}{2}$	$308 + 61\frac{1}{2}$	$56 + 65\frac{1}{2}$	Swift, streak	$279^\circ + 13^\circ$
20	9 48	1	$211 + 7$	$194 - 4$	Very swift	Lyrid
20	10 29½	>1	$243 + 14$	$234 + 5$	Swift, streak	Lyrid
20	10 47	1	$239 + 53$	$269 + 62\frac{1}{2}$	Slow, train	$206^\circ + 18^\circ$
20	12 28	>1	$308 + 40$	$316 + 40\frac{1}{2}$	Very swift	Lyrid

Bristol, April 22

W. F. DENNING

Vertical Decrement of Temperature and Pressure

IN NATURE of March 10 (p. 437), Mr. Maxwell Hall gives an interesting table of the vertical distribution of temperature and pressure in Jamaica, and, apparently in happy ignorance of the dangers of the process known as extrapolation, goes on to apply the results of observations extending to a maximum height of only 7400 feet to the determination of the probable temperature of meteorites in extra-terrestrial space. As he expresses a desire to know whether any similar results have been found in India, and as I have on several occasions during the past ten years discussed the vertical distribution of temperature and pressure in this country, I gladly take this opportunity of referring him to my papers on the meteorology of the North-West Himalaya, and on the temperature of North-Western India, published in the "Indian Meteorological Memoirs," vols. i. and ii. From the latter I extract the following table on the mean decrement of temperature up to a height of 12,000 feet, computed from the observations of twenty-five stations combined in various ways. For each month an interpolation formula of the form

$$T = T_0 + ah + bh^2 + ch^3,$$

was computed, and by its means the decrements from sea-level to 1000 feet, 1000 to 2000 feet, &c., were calculated. Finally, the average decrement for the twelve months was computed, and is here given in an abridged form. The curves for the several months differ very widely from one another, those for the summer giving the most rapid decrement at sea-level, and the decrement increasing with altitude in winter:—

Height	Mean temperature decrement				
Feet	° F.				
0 to 2000	6.16
2000 to 4000	5.87
4000 to 6000	5.61
6000 to 8000	5.37
8000 to 10000	5.16
10000 to 12000	4.98

The mean height of the barometer at sea-level in the region in question, the centre of which lies a little north of Simla, is about 29.8 inches; the mean at 6000 feet is 24.1 inches, and the mean at 12,000 feet about 19.4 inches. With these data, and adopting Mr. Hall's formula

$$\delta T = \lambda \delta P + \mu (\delta P)^2,$$

we find $\lambda = 2^\circ.979$ and $\mu = 0^\circ.02$. These coefficients do not differ widely from Mr. Hall's values, which are $2^\circ.92$ and $0^\circ.08$ respectively. At the limit of the atmosphere, where $\delta P = 29^\circ.8$, δT would be $-106^\circ.5$, which would give, as the mean temperature of external space, about -30° F., the mean temperature at sea-level being 77° F.

Taking the simplest formula, $\delta T = \lambda \delta P$, we find $\lambda = 3^\circ.19$, which is almost identical with the value quoted by Mr. Hall from an early volume of NATURE, but which, if it held good to the limit of the atmosphere, would make the temperature of external space about -18° F., since the mean temperature at sea-level is 77° F.

The only conclusion to be drawn from such observations is that the vertical decrement of temperature on mountains varies greatly with locality as well as season, and the results

obtained for one locality cannot be fully applied to another, much less extended to determine the temperature at the superior limit of the atmosphere.

An interesting point of resemblance between Mr. Hall's observations and those made on the Himalaya is that the diurnal range of temperature diminishes to a minimum at about 5000 feet, and then increases with increasing elevation.

Allahabad, March 30

S. A. HILL

Royal Society's *Soirée*

MAY I be permitted, through the columns of NATURE, to ask, on behalf of the Sub-Committee appointed to make arrangements for the forthcoming *soirée* of the Royal Society, that Fellows and others who have apparatus or objects of scientific interest suitable for exhibition on that occasion will communicate at once with the Secretaries or myself.

Royal Society, Burlington House

HERBERT RIX,
Asst. Sec. R. S.

HOMERIC ASTRONOMY¹

II.

TURNING to the second great constellation mentioned in both Homeric epics, we again meet traces of remote and unconscious tradition. Yet less remote, probably, than that concerned with the Bear. Certainly less inscrutable. For recent inquiries into the lore and language of ancient Babylon have thrown much light on the relationships of the Orion fable.

There seems no reason to question the validity of Mr. Robert Brown's interpretation of the word by the Accadian *Ur-ana*, "light of heaven" ("Myth of Kirke," p. 146). But a proper name is significant only where it originates. Moreover, it is considered certain that the same brilliant star-group known to Homer no less than to us as Orion, was termed by Chaldeo-Assyrian peoples "Tammuz" (Lenormant, *Origines de l'Histoire*, t. i. p. 247), a synonym of Adonis. Nor is it difficult to divine how the association came to be established. For about 2000 B.C., when the Euphratean constellations assumed their definitive forms, the belt of Orion began to be visible before dawn in the month of June, called "Tammuz," because the death of Adonis was then celebrated. It is even conceivable that the heliacal rising of the asterism may originally have given the signal for that celebration. We can at any rate scarcely doubt that it received the name of "Tammuz" because its annual emergence from the solar beams coincided with the period of mystical mourning for the vernal sun.

Orion, too, has solar connexions. In the Fifth "Odyssey" (121-24), Calypso relates to Hermes how the love for him of Aurora excited the jealousy of the gods, extinguished only when he fell a victim to it, slain by the shafts of Artemis in Ortygia. Obviously, a sun-and-dawn myth slightly modified from the common type. The post-Homeric stories, too, of his relations with Enopion of Chios, and of his death by the bite of a scorpion (emblematical of darkness, like the boar's tusk in the Adonis legend), confirm his position as a luminous hero (R. Brown, *Archæologia*, vol. xlvii. p. 352; "Great Dionysiak Myth," chap. x. § v.). Altogether, the evidence is strongly in favour of considering Orion as a variant of Adonis, imported into Greece from the East at an early date, and there associated with the identical group of stars which commemorated to the Accads of old the fate of Dumuzi (*i.e.* Tammuz), the "Only Son of Heaven."

It is remarkable that Homer knows nothing of stellar mythology. He nowhere attempts to account for the names of the stars. He has no stories at his fingers' ends of translations to the sky as a ready means of exit from terrestrial difficulties. The Orion of his acquaintance—the beloved of the Dawn, the mighty hunter, surpassing in beauty of person even the divinely-born Alodæ

—died and descended to Hades like other mortals, and was there seen by Ulysses, a gigantic shadow "driving the wild beasts together over the mead of asphodel, the very beasts which he himself had slain on the lonely hills, with a strong mace all of bronze in his hand, that is ever unbroken" ("Odyssey," xi. 572-75). His stellar connexion is treated as a fact apart. The poet does not appear to feel any need of bringing it into harmony with the Odyssean vision.

The brightest star in the heavens is termed by Homer the "dog of Orion." The name *Seirios* (significant of sparkling), makes its *début* in the verses of Hesiod. To the singer of the "Iliad" the dog-star is a sign of fear, its rising giving presage to "wretched mortals" of the intolerable, feverish blaze of late summer (*opora*). The deadly gleam of its rays hence served the more appropriately to exemplify the lustre of havoc-dealing weapons. Diomed, Hector, Achilles, "all furnish'd, all in arms," are compared in turn, by way of prelude to an "*aristeia*," or culminating epoch of distinction in battle, to the same brilliant but baleful object. Glimmering fitfully across clouds, it not inaptly typifies the evanescent light of the Trojan hero's fortunes, no less than the flashing of his armour, as he moves restlessly to and fro ("Iliad," xi. 62-6). Of Achilles it is said:—

"Him the old man Priam first beheld, as he sped across the plain, blazing as the star that cometh forth at harvest-time, and plain seen his rays shine forth amid the host of stars in the darkness of night, the star whose name men call Orion's Dog. Brightest of all is he, yet for an evil sign is he set, and bringeth much fever upon hapless men. Even so on Achilles' breast the bronze gleamed as he ran" (xxii. 25-32).

In the corresponding passage relating to Diomed (v. 4-7), the *naïve* literalness with which the "baths of Ocean" are thought of is conveyed by the hint that the star shone at rising with increased brilliancy through having newly washed in them.

Abnormal celestial appearances are scarcely noticed in the Homeric poems. There are neither eclipses¹ of sun or moon, nor comets, nor star-showers. The rain of blood, by which Zeus presaged and celebrated the death of Sarpedon ("Iliad," xvi. 459, also xi. 54) might be thought to embody a reminiscence of a crimson aurora, frequently, in early times, chronicled under that form; but the portent indicated is more probably an actual shower of rain tinged red by a microscopic alga. An unmistakable meteor, however, furnishes one of the glowing similes of the "Iliad." By its help the irresistible swiftness and unexpectedness of Athene's descent from Olympus to the Scamandrian plain are illustrated.

"Even as the son of Kronos the crooked counsellor sendeth a star, a portent for mariners or a wide host of men, bright shining, and therefrom are scattered sparks in multitude; even in such guise sped Pallas Athene to earth, and leapt into their midst" ("Iliad," iv. 75-9).

In the Homeric verses the Milky Way—the "path of souls" of prairie-roving Indians, the mediæval "way of pilgrimage"²—finds no place. Yet its conspicuousness, as seen across our misty air, gives an imperfect idea of the lustre with which it spans the translucent vault which drew the wondering gaze of the Ionian bard.

The point of most significance about Homer's scanty astronomical notions is that they were of home growth. They are precisely such as would arise among a people in an incipient stage of civilisation, simple, direct, and childlike in their mode of regarding natural phenomena, yet incapable of founding upon them any close or connected reasoning. Of Oriental mysticism there is not a vestige. No occult influences rain from the sky. Not so

¹ Görlitz finds a prediction of a solar eclipse at "Odyssey," xx. 357; but the expression appears quite indefinite and figurative.

² To Compostella. The popular German name for the Milky Way is still *Jakobsstrasse*, while the three stars of Orion's belt are designated, in the same connexion, *Jakobsstab*, staff of St. James.

¹ Continued from p. 588.