

of horizontal rocks. The question is, of course, a technical one for geographers to decide, and Prof. Johnson's short paper is worth consideration.

IN recent years the intercorrelation of meteorological data in different parts of the world has suggested important results which promise to have considerable economic value. Dr. G. T. Walker, Director-General of Observatories in India, has published a memorandum regarding the probable amount of monsoon rainfall in 1916 (Simla: Government Press; 8 annas). Data from South America, the Indian Ocean, and Ceylon, as well as from India, are briefly considered, and the result is to lead Dr. Walker to suggest that the outlook for the general monsoon rainfall of India is on the whole unfavourable this year, and that the rainfall is likely to be in slight or moderate defect, at any rate in the earlier part of the season. The deficiency is likely to be most marked in north-west India, while conditions appear to be favourable in Lower Burma, Assam, Malabar, and south-east Madras. Forecasting of this nature is still in its infancy, but Dr. Walker's attempt is most interesting, and promises to grow in value year by year.

THE August "Catalogue of Books in Standard Literature" of Mr. F. Edwards, High Street, Marylebone, contains many works dealing with general natural history, botany, conchology, ornithology, mammalia, entomology, and ichthyology.

OUR ASTRONOMICAL COLUMN.

THE AUGUST METEORS.—Mr. Denning writes:—"There is every indication that the Perseid display of 1916 will be of rather unusual activity. The shower was quite rich on July 31, August 1 and 5, and evidently increasing. Some fine meteors were observed, and especially on July 26, 10h. 7m., August 2, 11h. 41m., August 3, 9h. 44m., and August 5, 9h. 14m. That on the latter date was a fireball, and it formed a brilliant spectacle as seen from Bristol, falling from Cygnus to Ophiuchus.

"The maximum of the shower will probably be attained on Friday, August 11, but there will be many meteors visible also on August 12. The display is one noted for its long duration, but the really active phase of the phenomenon is included within one or two nights.

"The average height of the Perseids is from 81 to 53 miles, and their velocity 38 miles per second. Their flights are directed from the north-eastern sky, the radiant at 44°+57° in Perseus being situated in that quarter of the heavens.

"The time of maximum should be carefully determined, and the horary numbers ascertained during the nights of August 11 and 12. The moon, however, being very nearly full, will prevent many of the smaller meteors being observed.

"The more brilliant objects should be especially noted, and their paths among the stars recorded as accurately as possible. The phosphorescent streaks which are generated along the courses enable the direction to be exactly registered on a star map or celestial globe. These Perseids furnish many fine meteors, and fireballs frequently occur among them. In the case of one of the streaks or afterglows remaining visible for several minutes, its drift amongst the neighbouring stars should be noted as precisely as possible."

JULY METEORS.—Mr. Denning writes:—"The very fine summer weather prevailing during the latter half of July enabled a large number of observations to be obtained. The first Perseids were detected on July 8,

but the shower was not very prominent until July 31 and August 1. A splendid meteor was seen from it, or possibly from a contemporary display in the same region, on July 26, at 10h. 7m.

"There was a very active radiant of slow and brilliant meteors from the point at about 302°-8° from July 7 to the end of the month, and it was still visible on August 2. Twenty of its meteors were recorded at Bristol, and many others were seen by Mrs. Fiammetta Wilson at Totteridge. Six of the meteors were doubly observed, and their real paths have been computed.

"During the last week of the month the Aquarid shower came actively into play from 338°-11°. This stream has been only scantily visible in the past few years, but its return in 1916 showed it to have recovered its old-time prominence. The chief radiants seen were:—

July 31 .. .. .	31+53½	8 ↑'s	Perseids
August 1 .. .. .	31+55	10 ↑'s	"
July 25-29 .. .. .	36+47	7 ↑'s	θ Perseids
July 7-August 2 .. .. .	302-8	20 ↑'s	α Capricornids
July 23-August 1 .. .. .	302+24	6 ↑'s	Sagittids
July 23-29 .. .. .	333+58	7 ↑'s	ζ Cepheids
July 23-August 1 .. .. .	338-11	12 ↑'s	δ Aquarids

"The more interesting real paths were:—

July	G.M.T.		Mags.	Height	Height	Path.	Velocity	Radiant
	h.	m.		at first.	at end.			
				Miles	Miles	Miles	Miles	
8	11	59	> 2 - ♀	77	51	121	32	22 + 24
19	10	18½	1 - 1	76	51	60	26	301 - 8
25	10	13½	2 - 2	89	55	40	48	334 + 57
"	11	14	> 1 - > 2	70	41	61	25	302 - 8½
"	11	32	> ♀ - 2 + ♀	62	44	37	18	302 - 9
"	11	39	2 - ♂	61	41	40	23	301 - 10
26	10	7	> 2 - > ♀	86	49	91	37	35 + 51
27	10	34½	> 1 - > 1	69	60	52	37	338 - 14
"	10	15½	3 - 2	59	51	18	18	301 - 9
"	10	45½	4 - 3	69	43	36	54	332 + 25
29	10	3	> 1 - > 2	78	55	49	24	303 - 7
"	10	10½	2 - > 1	84	58	118	48	5 + 13
31	10	39	5 - 4	61	55	80	40	342 - 16

"Observers—Mrs. Fiammetta Wilson, Totteridge; Miss A. Grace Cook, Stowmarket; and the writer, Bristol."

A SUN-SPOT IN HIGH LATITUDE.—In the course of the heliographic work at Greenwich, it has been found that photographs of the sun taken at the Cape Observatory on December 26, 1915, show a small, but unmistakable, spot in the extraordinary latitude 59.6° S. This is considerably above that of the spot observed by Peters in 1846, the latitude of which was 50.4°, and is apparently the highest yet recorded (Journal B.A.A., vol. xxvi., p. 292).

LOWEST EFFECTIVE POWER OF A TELESCOPE.—It has usually been considered that the lowest power which can be employed on a telescope, while retaining full illumination, is one of five to each inch of aperture, this estimate being based on the assumption that the average diameter of the pupil of the eye is one-fifth of an inch. Mr. W. H. Steavenson has investigated the diameter of the pupil by flashlight photography, and has found that while one-fifth of an inch may be a fair estimate of the aperture in daylight, one-third of an inch is much nearer the aperture at night. An interesting application of this result has been made by Naval Instructor M. A. Ainslie, R.N., in connection with the 72-in. mirror of the Rosse reflector, now included in the collections at the Science Museum. The "original" eyepiece of the great telescope has been found to have an equivalent focal length of 7.7 in., giving a magnifying power of 84 and an emergent pencil of 0.855 in. diameter. It follows that the effective aperture of the speculum, when this

eyepiece was used, would be only 25 in., or approximately equal in light-gathering power to a refractor of 20-in. aperture. A power not less than 216 would be necessary to give the full benefit of the large mirror. Although the eyepiece in question was not the only one employed, it may be important to take account of the fact that some of the observations at Parsonstown were not made with the full aperture of the telescope (Journ. B.A.A., vol. xxvi., p. 302).

#### VENTILATION AND METABOLISM.

THE New York State Commission on Ventilation has issued an outline statement of the work done in 1915. In the first report the Commission supported the view of the English physiologists, that the principal factors which make for comfort are temperature humidity and air movement, and that the effects of poor ventilation cannot be explained by the presence of volatile organic poisons in the air or any chemical change in the atmosphere. Even slight differences in temperature produce characteristic physiological responses in the body, affecting the output of physical work and likewise the inclination to do mental work. "In only one respect did the chemical quality of the air breathed show any characteristic effect on the body mechanism, this effect appearing in the slightly diminished appetite for food in a stale, unventilated atmosphere."

The Commission has now sought to find what quality of the stale used air has this effect. Is it the odour present? the increased CO<sub>2</sub>? or what? Artificial body odours and excess of CO<sub>2</sub> have been introduced into a room ventilated with fresh air, but these have not produced the effect on the appetite. We do not believe that the Commission has ever properly eliminated the physical conditions. In their experiments they arranged that the temperature (wet and dry bulb) should be kept the same in the ventilated as in the stale-air chamber, and in the latter they placed a table fan to blow air upon the subjects, in order to imitate the current of air which circulated in the chamber ventilated with fresh air. There is no proof that the fan had this effect. It may not have ventilated the clothes of the subjects as effectually as the current of air did in the fresh-air chamber. We would suggest that the rate of cooling be measured with the katathermometer. Until this is done we cannot accept the view that the diminished appetite is due to any chemical alteration of the stale atmosphere. It seems more likely to be caused by a diminution in metabolism resulting from a lessened rate of cooling of the body surface.

The Commission says that for extreme mental concentration, involving an almost entire absence of physical exertion, a temperature of 75° at 50 per cent. relative humidity was preferable to 68° at the same humidity, whereas for tasks involving greater motor effort, such as typewriting, the cooler temperature was coincident with the greater output. Here again data are wanted as to rate of cooling. Was the atmosphere a still one? In this country 63° F. is regarded as a suitable temperature, but the comfort is far more a question of rate of cooling than of temperature. We would point out that mental concentration which demands an entire absence of physical exertion and so warm an atmosphere tells against the health of the body; the metabolism is greatly reduced, and with it the appetite; the digestive organs miss the massage due to bodily exercise and deep breathing; the circulation is not made vigorous by the pumping action of the skeletal muscles and those of respiration; and the lungs are but little expanded by the shallow breathing. Daily open-air exercise is essential to compensate for

such intense mental application if the health is to be maintained. Such work, together with high feeding, alcoholic pick-me-ups, and amusements taken in hot atmospheres, leads to the bodily flabbiness and middle-age degeneration of the business man. The scholar requires his "constitutional" or else he will become hypochondriacal.

The Commission has examined the conditions of the nasal mucous membrane in hot and cold atmospheres, and generally confirms conclusions reached by the reviewer (*cf. Lancet*, May 10, 1913). In the majority of subjects examined the reaction from heat is one of increased swelling, moisture, and redness, and the reverse from cold. Air blown upon the face by fans greatly modifies the effect. On going from the cold to the hot room with fans there is a decrease in the size of the inferior turbinates and in the amount of moisture. The characteristic change on passing from the hot to the cold condition with fans is an increase in the turbinates and secretion. The Commission reports that laundry workers show a high percentage of cases of atrophic rhinitis, the result of working in hot humid atmospheres. The changes of the nasal membrane produced by environment must materially affect the incidence of infection by "colds." This subject is dealt with by the reviewer in an article published in the *British Medical Journal* for April 15, 1916.

Mr. Palmer, the chief of the investigating staff of the Commission, has fashioned a new sampling apparatus for the determination of aerial dust. Air is drawn, by means of an electric-driven fan, through a U-tube containing some water. The water is thrown into a spray formation in a conical glass vessel attached to the U-tube, and the air is washed of its suspended dust as it passes through the water shower. One hundred cubic feet of air can be put through in thirty minutes. The water can be evaporated and the dust weighed, or the dust can be estimated by the turbidity of the water against a set of standards, or the particles of dust—in a measured quantity of the water—counted under the microscope. The pernicious effect of dust on the lung is not properly realised by the public. Dust containing free silica is the most potent cause of phthisis prevalent in miners, granite and flint workers, etc. The motor-cars stir up clouds of dust from roads metalled with flint and granite. People dislike the dust on their clothes, but do not realise the damage it causes to their lungs. All dusts diminish the efficiency of the lungs and lead to lessened expansion and shortened breath—the asthma of dusty occupations.

LEONARD HILL.

#### THE AMERICAN PHILOSOPHICAL SOCIETY.

THE annual meeting of the American Philosophical Society was held on April 13-15, during which nearly fifty papers were presented on a large variety of topics. The address of welcome was delivered by Dr. W. W. Keen, the president, who, with the vice-presidents, Dr. W. B. Scott and Prof. E. C. Pickering, presided at the various meetings.

We are able, from the material which the secretary, Prof. A. W. Goodspeed, has sent us from Philadelphia, to give brief abstracts of some of the papers which were read.

Dr. R. F. Bacon, "The Work of the Mellon Institute in its Relations to the Industries and to the Universities":—

The first industrial fellowship at the Mellon Institute was founded through a grant from a baking company which desired to improve its product. The sum of money given was used, as has been all