of low pressure and outward from anticyclones, the upper currents blow away from cyclonic and inwards upon anticyclonic areas. The most striking part of Mr. Ley's paper is the diagram in which he has summarised with no small amount of skill the facts of his cirrus-cloud observations. The point in the diagram is this: if the upper currents there depicted are to be regarded as tolerably close approximations to the movements of the cirrus-clouds of a cyclone, it follows that the region of the cirrus occupies a much higher level over the front portion of cyclone than it does over its rear—notably than over the north-west quadrant—a point of prime importance in relation to the theory of storms.

THE energetic way in which the Missouri (U.S.) weather service is being conducted may be judged of from the fact of the Report of the weather of May having reached us by post on June 24. This Report gives a statement of the rainfall for the month at from sixty to seventy stations, a map showing the distribution of the rainfall over the State for May, and a rapid sketch of the chief features of the weather. The rainfall was greatest in the central-southern districts, amounting to 8·00 inches at Bolivar, and least in the north-east, where at Canton it was only 1·77 inch. The increased efficiency of the system is well shown by the fulness with which the great storm of the 17-18th with its accompanying thunder and lightning and locally-developed whirlwinds has been accurately observed over Missouri, of which Director Nipher promises a full report. A separate sheet accompanies the Report, with all the instances of heavy rainfalls which have occurred during the past thirty years. Of these the most noteworthy as regards rate of fall was a downpour of 5·05 inches in an hour and-a-quarter on August 15, 1848. The heaviest continuous fall was 7·83 inches during thirty hours on June 18-20, 1859.

WE learn from the Mauritius Meteorological Report for 1876 that the rainfall of the whole island during that year was 12·63 inches less than the average, and that daily observations are now received from Seychelles, Rodrigues, and others of the neighbouring groups of islands. Valuable tables appear in the Report, showing the monthly means of pressure, temperature, and humidity from 1853 to 1874; but the noteworthy feature of the year's observations are the mean hourly values of the velocity and direction of the wind now published for the first time. These exhibit a well-marked daily period in the direction from E. 22° 15′ S., the most southerly point at 4 A.M., to E. 7° 0′ S. at 1 P.M., and thence back to E. 22° 15′ S. at 4 A.M., the daily variation thus being 15° 15′. Equally marked is the diurnal variation in the velocity, the minimum 9·7 miles per hour occurring from 2 to 3 A.M., and the maximum 18·5 miles per hour from 1 to 2 P.M. Hence, as regards this part of the south-east trades, the influence of the sun during the day is to double the velocity of the wind and to impress upon it a more truly easterly direction.

IN an eighth contribution to meteorology Prof. Loomis deals with the origin and development of storms, in which he shows that the great American storms are not confined in their origin to any particular locality, half of them originating on or close to the Rocky Mountains, and more than two-thirds north of 36° N. lat. The first stage in their development is the formation of an area several hundred miles in diameter, over which the barometer differs little from 30·000 inches, with areas of high barometer on the east and west sides, often another to the north, and occasionally a fourth to southward. The mean height of these different high areas examined was 30·310 inches on the west and 30·420 on the east side, that on the east side being thus the greater; and the distance of each from the central area of nearly uniform pressure which they surround is generally about 1,000 miles. A system of winds towards an intermediate or central point then sets in, resulting in a diminished pressure over the central area. The author supposes that the inflowing air escapes by an ascending current, carrying with it a large amount of vapour which as it is cooled is condensed into cloud and rain, and that the heat thus liberated further expands the air, thereby increasing the force of the inward movement of the wind. Rain is thus one of the conditions which increase the force of a storm. Prof. Loomis finds that an area of low barometer of considerable size may be formed and continue for several days with little or no rain, but in such cases the pressure did not fall so low as 29·250 inches. No storm of great violence has yet been found unaccompanied by a considerable fall of rain or snow. The general inward movement of the air towards a central area begins before any considerable precipitation of rain or snow has taken place. The easterly course of storms is considered to be occasioned by the general circulation of the atmosphere in that direction, and by the upward motion of the air taking place principally on the east side of the low centre as indicated by the position of the rain-areas. By this upward motion the air which presses in upon the east side of the low centre is prevented from restoring the equilibrium of pressure upon that side, and thus the low centre is steadily transferred toward the east, or the storm travels eastward. On the other hand, when the fall of rain or snow on the west side of the low centre is copious, widespread, and continued, the easterly progress of the storm is retarded, or arrested, or in some cases even retrogrades to westward, of which the storms of March 9-14, 1874, and January 1-18, 1875, were examples.

DR. WOJEIKOF sends to the Paris Exhibition new isobaric charts of the globe for January and July, which are rectifications of Buchan's isobaric charts, published in 1869, made by charting the large amount of fresh and fuller meteorological information collected since that time. Lake Baikal has recently been levelled, and its true height now ascertained to be 1,539 feet above the sea, instead of 1,342 feet, as given by Kropotkine. Correcting the barometrical observations for this height the mean pressure of this region in January is 30·630 inches, which is the maximum mean pressure for the globe at this season, and consequently 0·200 inch greater than was given in Buchan's chart. This extraordinarily high pressure in Eastern Siberia, which is 1·300 inch higher than that of Iceland at this season, is attributed by Dr. Wojeikof to the clear dry atmosphere of Siberia, and intense cold of the valleys and the high mountain barrier, which shuts off all communication, as regards the lower atmosphere, with the Pacific, where pressure in winter is low. A point of some interest brought out in the chart for July is the existence of two centres of low pressure controlling the wind systems of the Asiatic continent, the one being the Punjab and adjacent parts of Beloochistan, and the other the region around Lob-Nor. Dr. Wojeikof introduces an important feature into his charts in *not* tracing the isobaric lines over those portions of the globe which are at least 1,800 metres (5,906 feet) above the sea, some mountain-groups only being excepted. In this way the great plateau of Tibet, with its ramifications, is omitted, it being evident, for instance, that the winds of the Gangetic plains cannot be influenced by any differences that may obtain between the sea-level pressure there and that of the plains of Siberia, owing to the high, broad plateau of Tibet interposed between.

GEOGRAPHICAL NOTES

IN the course of the address which he recently delivered before the Geographical Society upon the subject of his travels on the western frontier of China, Capt. W. J. Gill, R.E., gave an interesting account of

his experiences on the borders of Thibet. He entered that land of mystery at Ta-chien-lu, whence the road at once ascends to the great plateau through a valley amongst granite rocks, capped at the summit with bare crags of limestone. Standing on the summit of the pass, by which the great upland country was reached, the traveller saw stretched below a fine valley closed in on both sides by gently sloping round-topped hills, covered with splendid grass. The road to Lithang was a succession of mountainous valleys, huge pine forests, and open glades. Capt. Gill found Lithang a cheerless place, some 12,500 feet above the sea-level. The natives told him that Ta-so, the last mountain-pass before reaching Bathang, was a very bad "medicine-mountain," the inconvenience caused by the rarefaction of the air at these great altitudes being attributed by them to subtle exhalations. On the road thither Capt. Gill passed the magnificent mountain Nen-Da, 22,000 feet high, and near the top of Ta-so he entered a little circular basin, surrounded on all sides but one by ragged precipices, with a pond of clear water at the bottom. On crossing the crest of the pass, he entered a large basin two miles in diameter, where a wild and savage scene presented itself to his sight: great masses of bare rock rising all round, torn into every conceivable shape by the rigour of the climate. The bottom of the basin was covered with the *débris* that had fallen from them, and some small pools of water in the hollows formed the sources of the stream, which eventually became a roaring torrent among the pine forests in the valleys below. Bathang, Capt. Gill found, had been recently rebuilt, after its destruction, a few years ago, in a frightful series of earthquakes, which, lasting for several weeks, devastated the whole neighbourhood. The town, he says, is chiefly remarkable for its immorality and its lamasery. Besides his description of the country Capt. Gill gave some interesting information respecting the habits of the Thibetans, contrasting them with those of the Chinese. Owing to their originally nomad mode of living they have no idea of inn accommodation, and the owner of a good house even will, as often as not, be found sleeping on the flat roof, whilst the hardy people in winter can sleep with their clothes half off and their bare shoulders in the snow; tables, chairs, and bedsteads are unknown in their houses. Thibet is a land flowing with milk and butter, the enormous quantity of the latter consumed by a Thibetan being very startling—butter in his oatmeal porridge, and huge lumps of butter in his tea. As a rule he does not drink much milk, which is mostly made into butter, but he is fond of sour cream, curds, and cheese; and this brings a Thibetan bill of fare to an end.

NEWS from Samarcand recently received gives some interesting descriptions of the district of Karatejin, which formerly belonged to Khokand but was afterwards ceded to Bokhara by the Russian Government. Karatejin, with the smaller districts of Dorwas, Wachia, and Shugnan, as well as the largest portion of Kojistan, are situated in the immediate neighbourhood of the plateau of Pamir. Karatejin in winter is completely isolated, and only during the summer months is accessible from the neighbouring districts. The manners and customs of its inhabitants are yet in the most primitive state. They have no idea of measures or weights, have neither markets, booths, caravans, nor indeed any institutions of public life. Theft is a thing unknown amongst them. Their occupation consists mainly in tending cattle, besides a little agriculture; everything is general property, as it were. If any family is short of provisions it is a matter of course that the next neighbour gives them what they may want.

THE *Pandora*, which is to be sent out by the *New York Herald* to the North Pole, has been re-christened at Havre the *Jeannette*. She leaves this week for San Francisco to complete her outfit, and starts next June for Behring's Straits. News has been received from Washington that there is no probability that funds will be appropriated this year for the intended Polar Colony of Capt. Howgate. No tidings have arrived yet from Capt. Tyson's preliminary expedition.

A CORRESPONDENT of the Hong Kong *Daily Press*, writing from Labuan, gives some interesting particulars respecting a scheme which, if carried out, may contribute much to the development of the resources of Borneo. An American company was formed for this purpose some time back, and obtained large concessions from the Sultan; but the policy of the United States government being to discourage in every way the extension of American commerce abroad, and the expenditure of any capital in foreign countries by its citizens, it has been deemed expedient to transfer the rights thus acquired to British merchants, and to leave to them the task of developing the enormous riches which now lie dormant in this beautiful island. For this purpose the steamer *America*, with representatives of both parties, went to Brunei, and the circumstances of the case having been explained to the Sultan, he not only consented to the transfer, but added to the former grants that of Gaya Island and the mainland opposite, including the magnificent harbour known as Gaya Bay, an enormous sheet of water said to be capable of sheltering the united fleets of the world. By this addition to the former grant the territory conceded now extends in an unbroken line from Kinarn's Bay, on the west coast, across the island to Sibuco, on the southern edge of St. Lucia Bay, on the east coast. This matter having been arranged, the *America* proceeded northwards, and, entering Maludu Bay, passed through the Malwalla channel to Sandakan. The approaches to this channel are very imperfectly surveyed, and abound with coral reefs and shoals not marked on the charts. From Sandakan the steamer went on to Sulu, and anchored in Membong Bay, about fifty miles south of the petty fort of Bhanuar, which has been held by Spain for the last two years. The Sultan of Sulu, when visited, expressed his hearty concurrence in any scheme which would tend to open up and civilise the rich and splendid provinces on the mainland now lying waste, and he at once confirmed the grants made by the Sultan of Borneo. Returning to Sandakan, the party proceeded up the Kina Batangan River in a steam launch, penetrating nearly two hundred miles into the interior, where no European vessel had ever been before, and then, having taken formal possession of their property at Sandakan, proceeded on their voyage to Labuan.

THE Rev. W. G. Lawes, the well-known New Guinea traveller and missionary, has communicated to the *Colonies* an interesting account of a visit which he paid, towards the close of last year, to the previously unknown village of Kalo, on the western bank of the Uanekela (or Kemp-Welch) River, which empties into Hood Bay, New Guinea, not far from Kerefunu. Mr. Lawes says that the village is laid out in streets and squares, all of which are kept scrupulously clean, being swept every day by the women. He induced one of the chiefs to accompany him some three miles up the river, which he found takes a sharp curve a little way above Kalo, and becomes narrower, but after about a mile it widens out again into a fine broad stream. It is said to be navigable for a long distance, and, according to native accounts, runs to Manumanu, in Redscar Bay. On the Kalo side of the river groves of cocoa-nut trees abound, and betel-palms are also plentiful, while on the east bank numerous and extensive plantations of bananas and sugar-cane were seen. Mr. Lawes states that the villages round and near Hood Bay are inhabited by a fine race of men, who are industrious and kindly-disposed, though at first shy and suspicious. They have a warlike character, but their hostility to each other would probably be soon removed

if more constant intercourse were established among them. Cocoa-nuts are at present the only article of any commercial value which the natives possess, and it is probable that some day large quantities of *copra* will be exported from this part of New Guinea; no doubt, too, the country has other resources which are as yet undeveloped.

NOTES

In reference to our article (vol. xviii. p. 235) referring to the very unsatisfactory manner in which the publications of the Geological Survey are produced and distributed, we have received several communications professing to indicate the causes to which this unfortunate condition of affairs is to be attributed, and suggesting means by which it can be remedied. It would scarcely be within our province—even if it were in our power—to point out the particular departments or the individual officials with whom the responsibility for bringing about this almost perfect deadlock rests. We do, however, feel ourselves called upon to give expression to that dissatisfaction which is so widely felt in scientific circles, both in England and abroad, at the slowness with which the survey is carried on, the dilatoriness with which its results are published, the exorbitant prices charged for the maps and memoirs, and the parsimonious manner in which they are distributed. And in doing so we are acting no less in the interest of the overworked and often underpaid officers of the survey, whose efforts are frequently wasted, and whose patient labours fail to obtain proper recognition, through the neglect of the publishing department in making known the results of their work.

As an instructive comment on the above, we may state that we have just received a magnificent series of maps illustrating the geology of Wisconsin and Colorado, along with a thick descriptive volume relating to the former state, full of beautiful chromo-lithographic illustrations of the peculiar geological phenomena to be found in the state. In execution and scientific accuracy these maps are equal to anything of the kind we have seen produced in Europe, and their liberal distribution by the Central and State Governments ought to make our own Government ashamed of its "penny-wise and pound-foolish" parsimony. The Colorado maps are issued, under the care of Dr. Hayden, by the Department of the Interior, while the Wisconsin volume and maps have the names of Messrs. Chamberlin, Irving, and Strong attached to them.

Dr. Janssen has succeeded M. Puiseux in the astronomical section of the French Bureau des Longitudes, thus leaving vacant the post of geographer to the Bureau.

At its session of July 1, the French Academy of Sciences elected Prof. C. Friedel to the vacancy in the chemical section resulting from the death of V. Regnault in January last. His chief competitors were MM. Cloez and Schutzenberger. Prof. Friedel occupies the chair of mineralogy at the École des Mines. His time is devoted, however, chiefly to chemical research, and he is at the present day the most prominent representative of the modern school of French chemists, who have grown up under the eye of Prof. Wurtz. His activity as an investigator began in 1856, and since that time he has chronicled a large number of valuable results won in various departments, but more especially in organic chemistry. His name is associated chiefly with extensive and elaborate researches on acetones, and on silico-organic compounds, and with the remarkable series of syntheses in the aromatic series by means of aluminium chloride, which for some time past he has been carrying out in company with Prof. Crofts, of Boston. Although his hair is streaked with grey, Prof. Friedel possesses a vivacity, energy, and devotion to his science, unexcelled by any of the younger chemists of the day, and promising a long-continued activity in the future.

Among recent deaths abroad we notice those of Prof. J. L. Chateau, of Ivry-sur-Seine, Prof. Labat of Bordeaux, and Prof. Ehrmann, formerly Dean of the Medical Faculty of Strasburg, who was aged eighty-six at the time of his death.

Prof. Virchow is following up the cranial investigations which led him to assign a Turkish rather than a Slavic origin to the Bulgarian race. For this purpose he has recently received fifteen Bulgarian skulls from the battle-field of Kadikiöi, which have been carefully prepared by the red-cross surgeons.

Prof. Virchow has decided to resign his seat in the German Parliament. He takes this step solely because his parliamentary duties interfere with his scientific labours; and, while he may be a good enough politician, he thinks himself a better *savant*.

We briefly alluded recently to the annual session of the Vienna Academy of Sciences. At this session Baron von Rokitansky was re-elected president for the coming year, and the Crown Prince Rudolph of Austria was named honorary member. The class for mathematics and natural sciences has lost by death during the past year among its regular members K. v. Littrow, and among the corresponding members, the astronomer, Santini, of Padua, and the physicists Weber and von Mayer. These vacancies were filled by the election of Prof. E. Weiss of Vienna to Littrow's chair, and by the election to corresponding members of the zoologist, Prof. v. Brauer, of Vienna, the physicists, Prof. G. T. Fechner, of Leipzig, Sir William Thomson, of Glasgow, and Prof. J. Schwann, of Lüttich. The triennial prize for the most fruitful contribution to physics was assigned to Capt. A. von Obermayer, for his researches on the influence of temperature on the friction coefficients of gases. Prizes for the discovery of comets have likewise been assigned to MM. Winnecke, of Strassburg, Coggia, of Marseilles, Tempel of Florence, and Swift, of Rochester, New York. The Academy has appointed during the past year a standing committee for ethnographical researches in Austria. Prof. Doelter, of Graz, who was recently sent by the Academy to make a study of the extinct volcano, Monte Ferru, on the island of Sardinia, has recently submitted to the academy a detailed report of his investigations. The analyses of the lavas would tend to place them among the more modern eruptive formations. Monte Ferru exhibits a variety in the character of its lava deposits rarely found among volcanoes thus far examined. The chief species described are normal phonolite, trachytic phonolite, sanidine-plagioclase trachyte, sanidine-augite trachyte, felspar with and without olivine, leucite-basalt, trachyte,-tufa, rhyolite and hornblende-andesite.

Arrangements are being made in Paris for an interesting sequel in 1879 to the present exhibition, which shall be entitled "Exposition des Sciences appliquées à l'Industrie." It will occupy the old Palais de l'Industrie. Assurances of co-operation on the part of leading scientific and industrial personages have been so numerous, that the success of the undertaking is already well guaranteed. The programme defining the aims and limits of the exhibition will appear at an early date.

The *Medical Times and Gazette* regrets to learn that Dr. Burdon Sanderson has resigned his post as Professor at the Brown Institution. The work he has done in this position has been of a kind that is above praise. It has been mainly directed to the investigation of the phenomena of contagion, and, coupled with that of Dr. Klein, also connected with the Brown Institution, has done much to instruct us in the structure, functions, and characteristics of the lymphatic system—to mention only one series of researches. We sincerely hope that the post will be filled by one who will continue and expand the work already commenced in this invaluable Institution.