

opinion that this town is the rainiest place in Norway. This notion, however, like many other traditional beliefs, has been dissipated by the test of carefully-conducted scientific observations, for we learn from *Naturen* that the annual mean of its rainfall is exceeded by that of two among the other seventy Norwegian meteorological stations. Thus while at Bergen 1722 mm. are measured annually, the rainfall at Domsten and Florø amounts respectively to 1951 mm. and 1873 mm. It has further been shown that 105 mm. rain were registered at Holmedal on the Söndfjord, on the same day that the rainfall at Bergen reached 74 mm., the highest recorded since rain-measurements have been made there. There are in fact eighteen instances given by the meteorological reports in which the rainfall has elsewhere exceeded the latter measure. Among these the most remarkable have been supplied by Ullensvang and Flesje, at the former of which stations there fell in one day (December 8, 1884) 113 mm. rain, while at the latter 112 mm. were registered for the twenty-four hours on March 15, 1882. These downfalls, the highest recorded in Norway since the observations were begun in 1875, have been exceeded, according to Dr. Hamberg of Stockholm, at the Swedish station of Hernösand, where 118.5 mm. rain fell on August 19, 1878. Facts such as these effectually refute the opinion, alike strenuously maintained by natives and foreigners, that more rain falls at Bergen both in the year and in the course of one day than at any other place in Scandinavia. Such, however, is the character of the annual distribution of rain in this locality, that the chances are about equally in favour of a wet or a dry day.

In reporting to the Empress of China the occurrence of a violent earthquake at the town of Pu-erh on November 14 last year, the Viceroy of Yunnan observes with humility that this awful visitation is to be regarded as a penalty of Heaven for his own inefficiency and incompetency and that of his staff. They will, the memorialist promises, endeavour to take the lesson to heart and earnestly amend their ways. Pu-erh will be remembered by readers of Mr. Colquhoun's "Across Chrysé" as an important town on the borders of the Shan States, with a large trade in tea. The earthquake here referred to is also worth notice as showing that seismic activity during the past winter was manifested over a vast area, and indeed seems to have affected the greater part of the Old World. At Pu-erh the shock lasted an hour, causing the collapse of a large number of houses, temples, and public buildings, while many lives were lost, and much injury was caused to the inhabitants.

M. LÉO ERRERA calls attention in the *Bulletin Scientifique du Département du Nord* to the value of Indian ink, on account of its harmlessness and its intense coloration, for the study of certain microscopic organisms. He has succeeded in keeping infusoria, &c., alive for several days in the liquid, the carbonic matter not appearing to affect them in the slightest degree. For making durable preparations ink diluted with water should be gradually replaced by that diluted with glycerine. Many organisms which are distinguished with difficulty in water, are easily observed in water charged with Indian ink; this is especially the case with many *Alga*. M. Errera thinks that this new method could probably be applied with advantage to the study of the digestion of the infusoria, and to the movements of ciliated organisms.

THE additions to the Zoological Society's Gardens during the past week include a Green Monkey (*Cercopithecus callitrichus* ?) from West Africa, presented by Mrs. Wall; a Rhesus Monkey (*Macacus rhesus* ♂) from India, presented by Miss Margaret Ellis; a Getulen Ground-Squirrel (*Xerus getulus*) from North-West Africa, presented by Mr. W. Cook; a Grey Ichneumon (*Herpestes griseus* ?) from India, presented by Mrs. Dundas; two Martinican Doves (*Zenaida martinicana*) from Bahamas, presented by Mrs. Blake; two Horned Lizards (*Phrynosoma*

cornutum) from Texas, presented by Mr. J. G. Witte; a Dorsal Squirrel (*Sciurus hypopyrrhus*) from Central America, an Indian Mynah (*Acridotheres ginginianus*), four White-backed Pigeons (*Columba leuconota*), a Black Hill-Squirrel (*Sciurus macrurus*) from India, two Chinese Jay-Thrushes (*Garrulax chinensis*) from China, a Sun Bittern (*Eurypyga helias*) from Brazil, two Greek Partridges (*Caccabis saxatilis*), South European, a Double-banded Sand-Grouse (*Pterocles bicinctus*) from Senegal, a Talapoin Monkey (*Cercopithecus talapoin*) from West Africa, a Negro Tamarin (*Midas ursulus*), a Humboldt's Lagotherix (*Lagotherix humboldti* ♂), a Rosy-billed Duck (*Metopiana peposaca* ♀) from South America, a Viscacha (*Lagostomus trichodactylus*), a Scorpion Mud-Terrapin (*Cinosternon scorpioides*) from Buenos Ayres, a Gadwell (*Chauleasmus strepera* ♂), nine Spotted Salamanders (*Salamandra maculosa*), European, purchased; a Crossoptilon (*Crossoptilon manchuricum* ♂) from Northern China, received in exchange; a Gayal (*Bibos frontalis*), two Long-fronted Gerbilles (*Gerbillus longifrons*), born in the Gardens.

OUR ASTRONOMICAL COLUMN

THE HARVARD COLLEGE OBSERVATORY, U.S.—The thirty-ninth Annual Report of this Institution has been issued, and with it Prof. Pickering's summary of observations of variable stars in 1884, made agreeably to the plan suggested by him in a communication to the American Academy of Arts and Sciences (vol. xix. p. 296). Thirteen observers, private and professional, have co-operated in these observations, amongst them Mr. Knott, of Cuckfield, and Mr. T. W. Backhouse, of Sunderland. In the summary referred to, the positions of the stars for 1875, the limits of variation and the periods, as far as reliably determined, are repeated from the circular of last year, and these particulars are followed by a statement of the number of observations of each star, made by the various observers in the course of 1884, so that it is easy to see which objects most require attention. It is certain that in this branch of observational astronomy there is ample work for a much larger number of co-operators, which it may be hoped that Prof. Pickering will succeed in enlisting amongst our amateurs, and eventually it may be possible to particularise the objects which each one may undertake to watch effectively, so as to secure observations of the whole or the majority of the list in each year.

With regard to the general proceedings of the Harvard Observatory, it is stated that photometric observations of the eclipses of Jupiter's satellites have been continued upon the system adopted in 1878, and 284 eclipses have now been thus observed, forty-seven since the end of October, 1883. The revision of the zone-observations of stars between 50' and 60' north of the equator has been completed during the year. Selections of stars for standards of stellar magnitude have been made for regions extending four minutes (time) in right ascension, and ten minutes in declination, and additional photometric methods of measurement are under consideration for determining such magnitudes with satisfactory precision. Observations of comets, of the spectra and colours of stars, and a tentative revision of the magnitudes of the *Durchmusterung*, have also formed a part of the year's work. We do not learn from the report that any attempt has been made to repeat the valuable series of observations on the rings of Saturn, made by the Bonds, &c., with the Harvard 15-inch refractor, when the planet was previously situated in the position it occupied in 1884; but the class of observations more especially attended to at present may have rendered this impracticable. Vol. xiv. parts 1 and 2 of the *Annals* have been published; the latter part has been circulated very recently.

TEMPEL'S COMET (1867 II.).—Up to the 7th inst. it does not appear that the editor of the *Astronomische Nachrichten* had received any notice of the re-observation of this comet. Doubtless, of the last degree of faintness, it could only have been commanded last month by instruments of the highest order. In the next period of absence of moonlight the theoretical brightness will have diminished. The comet will be due in perihelion again in the spring of 1892, a more favourable condition for the observation of this body than has existed in the present year.

NEW NEBULÆ.—M. Stephan publishes positions and descriptions of 100 nebulae discovered at Marseilles in the years 1883–85, in addition to the large number previously detected at that observatory. Not the least notable characteristic of M. Stephan's catalogues is the precision of the places given in them. He mentions that on October 1 and 2, 1882, neither the nebula Dreyer-Schultz 5085 nor λ 12 were perceptible in the positions assigned to them by the discoverers.

ASTRONOMICAL PHENOMENA FOR THE WEEK, 1885, MAY 17–23

(For the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on May 17

Sun rises, 4h. 7m.; souths, 11h. 56m. 10^s. 8s.; sets, 19h. 46m.; decl. on meridian, 19° 26' N.: Sidereal Time at Sunset, 11h. 29m.

Moon (at First Quarter May 21, 6h.) rises, 6h. 59m.; souths, 14h. 53m.; sets, 22h. 44m.; decl. on meridian, 18° 7' N.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian
Mercury ...	3 37 ...	10 30 ...	17 23 ...	0° 41' N.
Venus ...	4 18 ...	12 10 ...	20 3 ...	19 55 N.
Mars ...	3 24 ...	10 36 ...	17 48 ...	13 13 N.
Jupiter ...	11 0 ...	18 15 ...	1 30* ...	13 38 N.
Saturn ...	5 43 ...	13 51 ...	21 59 ...	22 18 N.

* Indicates that the setting is that of the following day.

Occultations of Stars by the Moon

May	Star	Mag.	Disap.	Reap.	Corresponding angles from vertex to right for inverted image
19 ...	α Cancri ...	4 ...	22 52 ...	23 15 ...	48 359
21 ...	B.A.C. 3407 ...	6 ...	0 21 ...	1 12† ...	125 276
21 ...	35 Sextantis ...	6 ...	20 48 ...	21 18 ...	26 340

† Is below horizon at Greenwich.

Phenomena of Jupiter's Satellites

May	h. m.		May	h. m.	
17 ...	23 21	II. occ. disap.	21 ...	0 21	I. occ. disap.
19 ...	20 28	II. tr. egr.		21 41	I. tr. ing.
20 ...	21 33	III. occ. reap.	22 ...	0 1	I. tr. egr.
	23 10	III. ecl. disap.		22 22	I. ecl. reap.

The Occultations of Stars and Phenomena of Jupiter's Satellites are such as are visible at Greenwich.

May 21, 3h.—Jupiter in conjunction with and 4° 17' north of the Moon.

THE IRON AND STEEL INSTITUTE

THE Iron and Steel Institute met on Wednesday, the 7th inst., when Dr. Percy gave the presidential address. After inviting the co-operation of the members in supplying him with materials for the new edition of his work on "Iron and Steel," and referring to Mr. Lowthian Bell's recent valuable work on the same subject, Dr. Percy drew attention to the existing universal depression, due, in his opinion, to over-production. "Darwinianism prevails in the manufacturing world as it does in the natural world, however painful and unwelcome may be that truth—only the fittest will survive. The struggle may be severe and to many persons disastrous, but so long as supply exceeds demand, it is inevitable, and the result is not doubtful."

In the matter of technical education he regretted that a few of its professed friends should have indiscreetly attempted to imbue all our artisans with the notion that the one thing which at present they urgently need is technical education, and that it will be certain to benefit them all alike, whereas in some trades, such as that of the file-cutter, the marvellous skill which is alike the surprise and admiration of all is to be obtained only by the practice of his art. He referred with pleasure to the judicious and enlightened way in which Sir Bernhard Samuelson, M.P., had advocated technical education in its widest sense, and rejoiced over the liberality of the founders of the Owens College (now the Victoria University) in Manchester, the Mason College in Birmingham, and the Firth College in Sheffield, and of the Whitworth Scholarships, through whose aid scientific instruction is placed within the reach of the artisan class.

The major portion of the address was devoted to the physical and chemical properties of iron and steel, and the learned President's remarks brought out in strong relief the prevailing want of knowledge. How comes it, he inquires, that the force of cohesion should be increased by mechanical treatment, which, *a priori*, might be supposed would tend in greater or less degree to produce disaggregation? Why is iron or steel wire increased in strength by wire-drawing? What is the cause of the physical changes which some metals and alloys have been observed to undergo spontaneously while at rest and under ordinary atmospheric conditions?

"It is not many years since that we had to grope about to discover an analysis of iron ore or of pig iron, whereas now we are actually overwhelmed with such analyses. We are deluged with percentages of carbon, graphitic or combined, of silicon and manganese, of sulphur and phosphorus. We are bewildered by this vast accumulation of material. What is now wanted is the man to reduce it to law and order, to evolve from it principles for our sure guidance. But the problem is so intricate and complex that no common brain can solve it. What are the physical properties of pure iron after fusion? What are the chemical and physical properties of compounds of pure iron and pure silicon in various proportions? What are the modes of existence of manganese, silicon, and phosphorus when present together in pig iron? What is the *modus operandi* of manganese in the manufacture of iron and steel? Why are animal matters or certain other substances rich in nitrogen, required in case-hardening iron? Is any nitrogen or any compound of it imparted to the case-hardened part of the iron? These and such like questions the metallurgist asks of the natural philosopher and chemist, and has failed hitherto to receive a reply."

Having concluded what may be called the technical part of his address, Dr. Percy treated the question of the extent to which the Government of a country should engage in manufacture, and stated "that, if it could be shown that the people as a whole would be benefited by the Government's engaging in manufacture, then the Government was bound to take that course." Treating the various cases of armour-plates, steel for guns, and steel for ship-plates, he showed that in each case, owing to competition, co-operative management, and other causes, private industry was always able to produce articles as good as and cheaper than the Government.

The address was listened to with the greatest attention throughout, both on account of the inherent interest of the matter and the great oratorical skill employed in its delivery. The closing paragraphs are of such universal interest that we quote them verbatim:—

"Everything in this world, nay, there is reason to believe everything in the universe itself, is changing from moment to moment. There is, as I have stated in print long ago, nothing constant but change, however paradoxical that statement may appear. Every drop of rain that falls, for instance, exerts a levelling action on the hills and mountains, and carries down with it in its course to the ocean a minute yet sensible portion of earthy material. In the moral world the like incessant change is going on, and no one can predict what the final result of that change will be. Our globe may, it seems to me, be fitly compared with the laboratory of the philosopher. The one, to our finite understandings, may appear the scene of social and political experiments, just as the other is the scene of chemical and physical experiments. But of this we may be sure, that invariable and irresistible law guides all things, immaterial as well as material. When I reflect on the intricate social problems of the day, the solution of which excites dread in the minds of many, I fancy I see the social molecules, if I may use such an expression, actively at work in rearranging and adjusting themselves to new conditions, and producing results as surprising as they are remarkable. The mysterious forces, whatever they may be, which regulate the movements of those molecules, are as certain in their operation as those which determine the course of the planets in their orbits. Both are equally uncontrollable by the agency of man, and politicians will in vain struggle against them."

"There is a question that must often occur to us, namely, what will Great Britain be when our vast reservoir of material force, coal, is exhausted—a result which many members of the Iron and Steel Institute are doing their utmost to accelerate? The time must come when, in consequence of that exhaustion, Great Britain will cease to be a great manufacturing nation, unless some new source of force should be discovered, which there is