

official visit the other day to the schools of apprenticeship established at the expense of the City of Paris in the rue Herold and the boulevard of La Villette. The time required for the scientific education of the young workmen is three years. During the first year the pupils are trained in working wood as well as iron. The choice of the speciality is only made at the beginning of the second year. No work is executed without a drawing having been made, so that the workman is enabled to understand the use of the object he is manufacturing. Regular courses of lectures are given in the establishment on scientific subjects. Meanwhile experiments are conducted in three different primary schools, to determine whether it is possible to join manual to mental training in all the city schools.

PROF. HULL has published a fourth edition of his "Coal-Fields of Great Britain" (Stanford). This edition has been largely rewritten, and contains an entirely new chapter on Carboniferous Plants, by Prof. Williamson, F.R.S. The Classification of the Carboniferous Series of Beds has been modified in accordance with the views enunciated in Prof. Hull's paper on this subject read before the Geological Society in 1877. Various other modifications have been made in accordance with the results of recent geological research, and the statistical portions have been brought down to 1878.

MESSRS. LONGMANS AND CO. send us the fourth edition of Prof. Atkinson's "Natural Philosophy for General Readers and Young Persons," translated and edited from Ganot's French work. To this edition have been added twenty-five pages of new matter and sixteen additional illustrations.

MR. E. S. BAKER, photographer of Bristol, sends us a photograph of a jar, which is a fine illustration of the fact that water expands on freezing. During the recent frost the water in the jar froze, and the ice is seen protruding from its mouth to a considerable distance like a well-shaped cork.

MR. C. V. RILEY of 1700, Thirteenth Street, Washington, writes to us that, having been obliged to cease the publication of the *American Entomologist*, he has a few full sets of vol. iii., just closed, to dispose of, and has concluded to send the full volume to all former subscribers who may want it, or to any Library, Natural History Association, or editor of journal, postage prepaid, at the reduced price of \$1.50. The information in the magazine, Mr. Riley states, is of permanent interest, and the volume will be of value to any one interested in entomology in any of its bearings.

M. CH. JOLY has republished as a pamphlet a paper which he lately contributed to the *Journal* of the National Horticultural Society of France, under the title of "Note sur une Exposition de Géographie botanique et horticole, organisée par la Société Centrale d'Horticulture de Nancy."

NEW SOUTH WALES, Victoria, and South Australia have agreed to jointly bear the expense of exterminating the *Phylloxera vastatrix*, the alarming extension of which in Victoria has threatened the destruction of the wine industry.

WE have received the three first numbers for this year of the *Chicago Field*, which seems modelled on a small scale after its well-known English contemporary.

THE *Revue Scientifique* of January 29 contains a lecture recently given at the Sorbonne by M. Faye, on the Volcanoes of the Moon.

AT Cracow a new Polish review for literature, science, and art is now being published fortnightly. Its title is *Museum*, and its editor Dr. Thaddaeus Rutowski.

THE works in the Arlberg tunnel are progressing. On the Tyrolese side the lower shaft has been pushed to a distance of

340 metres, by help of the boring machines, and in spite of the hardness of the rock the daily progress is two metres. The upper shaft is some 100 metres behind.

A NUMBER of Roman antiquities were found last year during some military earthwork operations near Metz, close to the Lunette d'Arçon. It appears that the place was one of the most important burial-places of Roman Metz. The Metz Geological and Archæological Society gave the details at its last December meeting. Some thirty-five vases, four metal objects, three coins, and two tombstones with inscriptions are mentioned. Of human remains four skulls were found, one of which was lying upon a square stone plate, besides carbonised (cremated?) bone remains in a round stone urn. The inscriptions were epitaphs; of the three coins, one dated from the year 41 (when Claudius commenced to reign), another from the year 160 (reign of Antoninus Pius). Prof. Schaaffhausen of Bonn states that three of the skulls found belong to three different tribes. One belonged to a German, another to a Frisian, the owner of the third came from so far a country as Lapland.

A REMARKABLE discovery of Russo-byzantine antiquities was made near Kiev some weeks ago, when a canal for the water-works of the city was being excavated. They consist principally of twenty gold and enamelled locketts, three buttons of the same materials with heads of saints upon them, gold rings, agraffes and studs, all dating from the fifteenth or sixteenth century; they doubtless served as ornaments upon the costumes of the grand princes. Besides these some thirty-four silver coins were found, also a highly original bronze vessel in the shape of a fabulous quadruped. The metal value of all the antiquities is estimated at 1000 roubles (150*l.*). The Archæological Commission has taken possession of them.

OUR ASTRONOMICAL COLUMN

THE OBSERVATORY OF HARVARD COLLEGE, U.S.—We have received the Annual Report presented to the Visiting Committee of this Observatory by Prof. Pickering on December 6. The year has been one of unusual activity in the establishment, funds which had been liberally forthcoming from its friends having enabled both the equatorial and meridian circle to be regularly employed, and further having allowed of many researches of importance being conducted with the smaller instruments. With the large equatorial Prof. Pickering claims that he has succeeded in making a more extensive series of observations for position of the satellites of Mars at the last opposition than was obtained elsewhere, and states that Deimos was last seen at Harvard Observatory; the number of observed angles of position of Deimos was 825, and of Phobos 278, and that of observed distances 245. In addition to measures for position photometric observations were made, which appear to show that if the satellites possess a capacity for reflecting sunlight equal to that of the planet, Deimos may have a diameter of about six and Phobos of seven miles. It was noted at various observatories that Deimos appeared somewhat brighter in 1879 than at the preceding opposition in 1877, and in both years Prof. Pickering states it seems to have been brighter measured photometrically, and to have been seen more easily when it followed than when it preceded Mars.

Photometrical determinations of the times of eclipses of Jupiter's satellites, commenced in the summer of 1878, have been continued during the year, and it is considered with reasonable hope that these phenomena may be more accurately observed than hitherto by this method. Observations of planetary nebulae described in the previous Report have been nearly completed.

With regard to spectroscopic observations, Prof. Pickering says the most remarkable discovery is that the spectrum of No. 17681 of Oeltzen's Catalogue, the place of which for 1880 is in R.A. 18h. 1m. 17s., N.P.D. 111° 1', possesses a peculiar character. "The light of this star is principally concentrated in two points of the spectrum, one in the blue, the other in the yellow, a little more refrangible than the D line. A faint continuous spectrum is also seen."

The variable star of Ceraski, the true period of which was determined at Harvard College, is referred to; systematic observations have been made upon it. The Report describes the progress made in observations with the "meridian photometer," whereby it is intended to determine the light of all stars visible to the naked eye between the North Pole and N.P.D. 120°. The principal want of the Observatory at the present time is stated to be the means of publication of these and other classes of observations, the large number of volumes issued during the last five years having exhausted the funds specially appropriated for defraying expenses of publication.

CERASKI'S VARIABLE STAR T CEPHEI.—Prof. Julius Schmidt, from his own observations of minima of this variable in the last five months of the past year, finds reason to conclude that in that interval each successive period was longer by 0.08753m. or 5.25s. than the preceding one, and has calculated the times of minima upon this assumption between June 11, 1880, and February 15, 1881. For elements with this correction to the period to be applied, he adopts for his starting-point—

Minimum ... 1880, December 7, 10h. 6.7m.
Athens M.T. + 2d. 11h. 50.812m. E.

E being the number of periods from December 7. Thus the next minimum is found to occur on February 5, at 6h. 50.3m. Athens time, or at 5h. 15.4m. M.T. at Greenwich. Prof. Schmidt has remarked what we believe was soon detected by Mr. Knott from his observations in October last, that for more than two hours about the minimum there is no perceptible variation of brightness; decrease and increase are very rapid, particularly the latter.

SWIFT'S COMET, 1880 α .—The Superintendent of the Observatory at Washington, Admiral Rodgers, communicates to *Science* of January 10, an orbit of this comet which has been calculated by Prof. Frisby from three meridian observations made there on October 25 and November 7 and 25, and without any assumption as to the periodic time. The revolution resulting from this application of the general method is about 2178 days, or a little less than six years, and thus the conclusion arrived at by MM. Schulhof and Bossert of Paris, and Mr. S. C. Chandler of Boston, U.S., receives confirmation. From the position of the orbit it happens at present that only every second return to perihelion can be made available for observations.

BARON DEMBOWSKI.—Practical astronomy has sustained a severe loss in the death of Baron Ercole Dembowski, which took place on the evening of the 19th ult. at Monte, Frazione di Solbiate, Arno. Few have attained as great skill or exhibited greater industry and patience in that somewhat difficult and tedious branch, the measurement of the double stars, to which the Baron specially devoted himself, and we hope some means may be found of publishing in a collective form the results of his long-continued labours in this direction.

METEOROLOGICAL NOTES

OUR readers will learn with much satisfaction that Sweden has resolved to take part in the international meteorological and magnetical observations in the Polar regions, and arrangements have been made for carrying on the observations from June 1, 1882, till June 1, 1883. The house erected at Masselbay in Spitzbergen by Nordenskjöld's expedition, is still in good condition, and will be fitted up for the observatory. In connection with the Spitzbergen Observatory, Haparanda, at the head of the Gulf of Bothnia, is to be created into a first-class observatory, and furnished with Theorell's self-registering and printing meteorological apparatus; and all other observations will be made which are expected of a first-class observatory. M. Hjelström is appointed director of the Haparanda Observatory. The funds to meet the expenses of the expedition and the two observatories have been most generously supplied by M. L. O. Smith, Stockholm. Prof. Hildebrandson, the eminent Swedish meteorologist, has been entrusted with the discussion of the observations made by Prof. Nordenskjöld on the celebrated *Vega* Expedition, to the publication of which meteorologists will look forward with the liveliest interest.

IN his fourteenth contribution to meteorology Prof. Loomis returns to the discussion of the interesting question of the course and velocity of storm centres in tropical regions. In a previous communication he had shown that in middle latitudes the average

progress of storm centres corresponds pretty closely with the average direction of the prevailing wind of these latitudes. In marked contradistinction to this result is that now obtained regarding the course of the intertropical cyclones which occur within the region of the North-east Trade Winds. These cyclones, instead of following the ordinary course of the Trades towards the south-west, advance westward, but in a direction somewhat north of west.

DURING the winter months, storms while crossing the United States frequently advance during a part of their course from north-west to south-east. This course is followed most frequently in the region between the Rocky Mountains and the Mississippi, is seldom continued as far south as lat. 30°, and the storm centre, after reaching its most southerly point, often changes its course towards the north-east. Storms which cross the United States north of lat. 38° generally pursue a course a little to the north of east; while those which come from south of that latitude pursue a course nearly north-east. During the summer months however few storms travel south of lat. 38°, and during this part of the year the average course of storms is almost exactly towards the east.

PROF. LOOMIS next institutes a comparison between the West India hurricanes and those of the Bay of Bengal, China Sea, &c. The average course of the latter is towards the west, ranging from 13° south of west to 86° north of west, which agrees closely in this respect with the general course pursued by West India hurricanes. The velocity of their onward course is however markedly different, being only about eight miles per hour, which is less than half the average velocity of the West India cyclones. The average latitude when the course becomes north is nearly lat. 20°, being 10° more to southward than in the West Indies, and the velocity during this part of the course is only about nine miles an hour. Ultimately the cyclones curve round and pursue a course nearly east-north-east, with a velocity of onward movement scarcely reaching ten miles an hour, or less than half of the velocity found for West India hurricanes. Lastly, while in the West Indies cyclones or hurricanes have been found no farther south than lat. 10° N., in Southern Asia they have occurred as far south as lat. 6° N.

THE concluding part of the Contribution is taken up with an examination of those storms of middle latitudes which advance in a westerly direction. In these cases, which may be regarded as abnormal directions, it is found that the wind is generally greatest on the east side of the low centre of the storm. While there are thus on the east side of the low pressure areas, causes tending to increase pressure on that side, there are different conditions on the west side tending to divert the winds westward, and this, Prof. Loomis thinks, is the most important reason why in such cases the storm centres advance to westward. In the United States, over the Atlantic, and in Europe, the influence of one area of low pressure upon another is a very common cause of abnormal movements of storm centres—such, for instance, as the coalescence of two low areas into one, resulting occasionally in an apparent westerly movement of the centre of lowest pressure.

THE "Results of Meteorological Observations made at Mauritius during 1877" fully sustains the high reputation of Dr. Meldrum's previous reports for fulness of detail, accuracy, and special observations not usually given in meteorological reports. The hourly monthly values have been calculated from the readings of the barograph for the year, and a valuable table is appended to this part of the report (p. 5), showing the mean monthly diurnal variation of atmospheric pressure for the three years 1875-77. The value of these results will be greatly enhanced when the thermograph which has been received has been got into working order. A comparison, a very satisfactory one, is made of the barograph readings with those of the standard barometer. As in 1876 the wind during 1877 attained its annual maximum velocity in the colder months from June to August, and its minimum in the warmer months, from November to March; and its diurnal maximum velocity from 11 a.m. to 2 p.m., and its minimum from about 2 to 5 a.m. The departures, however, from these times are such as to point to a considerable number of years' observations as required before the true average can be ascertained. Thirty-one stations for recording the rainfall are now in working order, and in each case the annual amounts available from 1862 are printed, and the averages of the years given for each station. Mean temperatures for seven stations appear in the report, the three highest