

for the sine and cosine with the special conditions that $\sin 0 = 0$ and $\cos 0 = 1$. Dr. Lunn considers that a more elementary treatment can be obtained by starting from the following postulates, viz. the addition formula for the sines of numbers of the straight-angle set, the continuity of the sine and cosine, the assumptions that $\cos 90^\circ = 0$ $\sin 90^\circ = 1$, $\cos 180^\circ = -1$, that $\cos x$ is not negative between 0 and 90° , and that if $\sin x/x$ has a limit when x vanishes that limit is unity. The last assumption is required to determine the unit of angular measurement.

In a paper communicated to the *Rivista marittima* for March last, and reprinted by the *Officina poligrafica italiana* of Rome (1908), Dr. Filippo Eredia discusses the prevailing winds in the Straits of Messina, and gives statistics of the observations made at various semaphore stations along the Italian and Sicilian coasts.

It was announced in last week's NATURE that on November 28 Mr. Thayer would give a demonstration at the Zoological Gardens of the obliterative effects of the costumes of animals. By an error, which we regret, the date was wrongly printed; it should have been November 18, and not November 28.

MESSRS. ISENTHAL AND CO., 85 Mortimer Street, London, W., have issued a list of precision instruments based on the resonance principle, containing information concerning the frequency and speed meters, as well as other instruments, constructed by them.

We have received from Prof. W. A. Herdman, F.R.S., a volume containing copies of four addresses delivered by him, in his capacity of president of the Linnean Society, at the anniversary meetings of the society in May of the years 1905-8. The subjects of the addresses were, in the successive years, Linnæus and artificial pearl formation, natural pearl formation, some fundamentals of sea-fisheries' research, and plankton studies in the Irish Sea.

OUR ASTRONOMICAL COLUMN.

COMET MOREHOUSE, 1908c.—The remarkable changes which have been shown to have taken place in the extent and form of comet 1908c are well illustrated by a series of photographs taken by M. Quénnisset at the Juvisy Observatory, and reproduced in the November number of the *Bulletin de la Société astronomique de France*.

Two photographs taken on September 30 with equal exposures showed changes in intensity, but were quite eclipsed by one taken the next night, October 1, between 10h. 48m. and 12h. 55m. The trail of a bright star interferes somewhat with the image of the comet's tail, but, despite this, it is seen that the tail has a large, bright condensation at some distance from the head. From the coma of the comet several narrow, straight streamers emerge, and then suddenly expand into a bright, nebulous mass which continues for some distance with a much greater breadth and diffuseness than the preceding part of the tail. It almost appears as though a tremendous activity of the head had emitted all this matter and had then subsided, leaving only the normal emission of material to form the straight, narrow streamers. This apparently fluctuating activity may easily be explained by assuming that, during its journey through space, the comet encounters meteor swarms of various densities.

These changes may be held to account for M. Bigourdan's widely published statement that, at about the time they were photographed, the comet lost its tail. The visual radiations certainly did decrease in intensity, but the photographic rays were not much fainter; M. Bigourdan's observations were visual.

Some of the photographs show a tail 17° long, that is, actually about twenty-seven million miles (43,000,000 km.), whilst the diameter of the nucleus is $10'$ of arc, or actually about 290,000 miles (460,000 km.).

Numerous photographs, showing changes similar to

those described above, have also been obtained at the Greenwich and Stonyhurst observatories.

Particulars of the more recent spectrum of the comet are published by MM. Deslandres and Bernard in No. 18 of the *Comptes rendus* (p. 774, November 2). The spectra were obtained with a specially designed spectrograph of 10 cm. aperture and 31 cm. focal length, fitted with an ultra-violet glass objective. A prism of the same glass, having an angle of 22° , was placed in front of the objective, and was, at times, supplemented by another of ordinary flint having an angle of 61° .

The spectra obtained differ on many points from those obtained earlier by Comte de la Baume Pluvinel and described in these columns. The present workers find that the ratio of ultra-violet to visual rays is abnormal, and that the continuous spectrum is very persistent both in the images of the head and of the tail. The hydrocarbon bands, usually a prominent feature of cometary spectra, especially in the green region, are apparently absent, whilst of the numerous cyanogen bands reported by de la Baume Pluvinel only the two first heads of the ultra-violet group, at λ 388, were photographed. The three strongest bands appear at about λ 456.1, λ 426.7, and λ 401.3, and are due to some unknown light-source. Many of the bands are double, and MM. Deslandres and Bernard suggest the possibility of this being due to the Zeeman or the Doppler effect, or, maybe, to some new phenomenon special to comets.

A NEW SPECTROSCOPIC LABORATORY AT PASADENA.—Owing to the difficulty of obtaining large supplies of electricity at the Mount Wilson Observatory, Prof. Hale has recently installed a new spectroscopic laboratory at Pasadena, where the laboratory researches necessary for the elucidation of present-day solar problems may be carried out. An illustrated description of the new laboratory appears in No. 3, vol. xxviii., of the *Astrophysical Journal* (p. 244, October).

The main instrument is a 30-foot spectrograph sunk in a waterproof well, 8 feet in diameter, in the concrete floor of the laboratory. The numerous pieces of apparatus for producing radiations are arranged around the well-head, the light being reflected on to the spectrograph slit by a plane mirror. Among the apparatus briefly described in the present note there is an electric furnace capable of withstanding pressures up to 200 atmospheres, and of giving temperatures up to 3000° C.; this is to be employed for studying the spectra of such refractory metals as vanadium and titanium at widely different temperatures. A transformer capable of producing voltages from 1000 to 64,000 has also been installed, whilst a complete outfit for the study of the Zeeman effect in various spectra is intended for the laboratory researches which will naturally follow Prof. Hale's recent and remarkable discoveries in the sun-spot spectrum.

A LARGE GROUP OF SUN-SPOTS.—Another large group of sun-spots, made up of a great number of smaller spots, has recently been seen on the solar disc. This group was first observed at South Kensington on November 6, and was for several days quite easily visible with the naked eye. Another extensive group was first seen, near the limb, on November 12, and was visible to the naked eye on November 17.

BIOGRAPHICAL MEMOIR OF ASAPH HALL.—In April of this year Mr. G. W. Hill read before the National Academy of Sciences, Washington, a biographical memoir of the late Prof. Asaph Hall giving an account of his life and work. This memoir now appears in vol. vi. of the *Biographical Memoirs of the society* (pp. 241-309), and is accompanied by a valuable bibliography of Prof. Hall's writings, published between 1858 and 1906, to the number of four hundred and eighty-six.

A RESEARCH ON THE MOVEMENT OF COMET WOLF.—The results obtained from the first part of a research into the movement of comet Wolf, undertaken by M. Kamensky, of the Pulkowa Observatory, appear in No. 13 of the *Bulletin de l'Académie impériale des Sciences de St. Pétersbourg* (October, p. 1041). The present results consist of tables for the calculation of the eccentric anomaly, and they may be used in calculating the perturbations of Faye's and Tempel's comets also.