and infra-red to pass. M. Stefanik has arrived at the conclusion that if only a limited region of the spectrum be allowed to enter the spectroscope this region is seen much better than if the total light were employed, for, despite the large absorption by the numerous pieces of glass included in his apparatus, he was able to observe and to map easily the spectrum down to 1 μ. The group Z was always easily visible, also X, and the lines π, ζ, σ, and τ more rarely. It appears from the variations in the intensities of the lines that some of them are of telluric origin. According to the *Annuaire* of the Bureau des Longitudes the infra-red is visible to 0·795 μ, but by the employment of the screens M. Stefanik has extended the limit to at least 0·900 μ.

THE Oxford University Junior Scientific Club is to be congratulated on the May number of its Transactions. Prof. H. A. Miers gives an interesting account of his recent investigations, in collaboration with Miss Isaacs, of spontaneous crystallisation and the nature of supersaturated solutions, while a paper by Mr. M. H. Godby, on the place of natural science in education, is full of good things, and deserves notice of a larger public.

IN a note in the *Physikalische Zeitschrift* (No. 8, p. 257) Drs. Stefan Meyer and Egon von Schweidler point out that Madame Curie, in a criticism of their work, referred to in NATURE (vol. lxxiii., p. 549), misinterpreted the tenor of their original communication in assuming that they considered polonium to consist of a mixture of radium D, radium E, and radium F. The conclusion they actually formed (Proceedings of the Vienna Academy of Sciences, February 1) was in reality the same as that arrived at by Madame Curie, namely, that polonium is identical with radium F. In another paper (Vienna Academy of Sciences, *Anzeiger*, No. 12) Drs. Meyer and von Schweidler confirm, however, the view that radio-lead is a mixture of radium D, radium E, and radium F, and describe the separation of these substances by electrolysis. Several determinations of the constant of decay of radium E were made as a means of characterising this substance, and the nature of a new radio-active product from actinium is discussed.

THE transformation of oxygen into ozone at high temperatures is the subject of a paper by Messrs. Franz Fischer and Fritz Braehmer in the *Physikalische Zeitschrift* (No. 9). It is shown that when a platinum wire or a Nernst filament is rendered incandescent whilst surrounded by liquid oxygen, or when an arc lamp or hydrogen flame is played upon liquid oxygen, ozone is formed. When the action is prolonged the amount of ozone formed increases; in one experiment 1 per cent. by weight of the oxygen used underwent condensation. Experiments are adduced to prove that the formation of ozone in these cases is solely a thermal phenomenon, and is not to be referred to an ozonising ultra-violet radiation. When any of the methods of heating described are adopted in ordinary air, nitric oxide appears to be the sole product; in such a case the ozone is not cooled and removed from the sphere of action sufficiently quickly to prevent its decomposition. It is well known that when a hydrogen flame burning in oxygen is played upon water or ice hydrogen peroxide is formed in minute quantity; it is interesting to note that when hydrogen is burnt in liquid oxygen no hydrogen peroxide can be detected. In the former case water is oxidised to hydrogen peroxide, in the latter molecular oxygen is converted into ozone.

OUR ASTRONOMICAL COLUMN.

DISCUSSION OF FACULÆ OBSERVATIONS.—An interesting discussion of the observations of faculæ, in which Prof. Mascari compares the frequency and intensity of these phenomena with the solar activity as indicated by sun-spots and the variation of the total luminous radiation from the solar disc, appears in No. 5, vol. xxxv., of the *Memorie della Società degli Spettroscopisti Italiani*.

Since 1894 the groups of faculæ on the solar disc have been observed, and their number and intensity recorded, on every day that the atmospheric conditions were favourable. The intensities were classified in five groups, viz. brightest (V.V.), bright (V.), ordinary, weak (*d.*), and weakest (*d.d.*).

Analysing the results thus obtained, Prof. Mascari finds that the third class (and possibly the second and third classes) decreased in frequency from that year of sun-spot maximum until 1901, sun-spot minimum, and then increased regularly up to the 1905 maximum. The (*d.*) and (*d.d.*) classes varied in the inverse sense.

Assigning numerical values to these classes, from 5 for the (V.V.) to 1 for the (*d.d.*), and taking the grouped mean for each year as the relative annual brightness of the faculæ, Prof. Mascari finds that this mean brightness also varies with the sun-spot activity, being 2·83 in 1894, 1·88 in 1901, and 2·97 in 1905. Combining, as a product, the mean frequency of the faculæ for each year with their relative mean brightness a similar result is obtained, the respective values being 29·80 in 1894, 4·62 in 1901, and 19·63 in 1905.

These results, combined with those obtained by himself in 1901 and Tacchini in 1878 showing that the chromospheric phenomena were less bright at sun-spot minima than at maxima, led Prof. Mascari to the conclusion that the luminous radiation of the sun is greater at the spot maxima than it is at the epochs of minima.

NEW METHOD FOR THE DISCOVERY OF ASTEROIDS.—In No. 4, vol. xxiii., of the *Astrophysical Journal*, Mr. J. H. Metcalf, of Taunton (Mass.), describes a method which he has employed successfully in the photographic discovery of asteroids.

This method is really an adaptation of that employed in the photography of comets, where the observer, instead of following the guiding star in the usual way, regularly moves the photographic plate during the exposure so that it follows the object which he hopes to photograph, and thus obtains a well-defined single image of that particular object, whilst the surrounding stars are represented on the plate by trails.

By moving his plate in a direction parallel to the ecliptic at a rate previously computed for an ideal asteroid, Mr. Metcalf has obtained some excellent, well-defined circular images of several known faint asteroids, and has also discovered some new ones. For example, one of the reproductions which accompany his paper shows a pair of images of an asteroid of the thirteenth magnitude which he discovered on March 22.

RADIAL VELOCITY OF α DRACONIS.—A brief note by Herr H. Ludendorff, published in No. 4088 of the *Astronomische Nachrichten*, confirms the variability of the radial velocity of α Draconis announced by the Lick observers. According to the latter, the radial velocity on June 16, 1902, was 0 km., and on May 4, 1903, and June 19, 1904, it was -42 km.; values of -43 km. and -40 km. were also obtained.

On two plates secured with the Potsdam spectrograph (iv.) on May 23 and 24, 1903, the displacement of the lines λ 4481 and Hγ gave the radial velocity of this star as -17 km. and -14 km. respectively.

USEFUL TABLES AND FORMULÆ FOR ASTRONOMICAL COMPUTATIONS.—No. 15 of the Publications of the Groningen Astronomical Laboratory contains a number of tables for photographic parallax-observations, prepared by Dr. W. de Sitter. Each table gives the parallax factors, for each hour of R.A., for every 10° of latitude, and also shows the limiting dates between which a star of the stated R.A. may be observed photographically.

No. 16 of the same publications is given in the same volume, and contains a number of trigonometrical formulæ

and a table of goniometrical functions for the four quadrants, compiled by Profs. J. C. and W. Kapteyn; additional formulæ, both for plane and spherical triangles where certain elements are small, are also included.

THE LEEDS ASTRONOMICAL SOCIETY.—We have just received No. 13 of the Journal and Transactions of the Leeds Astronomical Society, which gives a brief *résumé* of the work accomplished by the members of the society during the year 1905.

Eight papers read before the society during the session, dealing with popular astronomical subjects, are reproduced in the journal, together with a number of notes contributed by members to various publications.

From remarks made in the report it appears that this society is greatly in need of increased support, financial and general.

METEOROLOGICAL OBSERVATIONS.

FROM the "Jahrbücher" of the Austrian Meteorological Office for 1904 it appears that changes have recently been made in the comprehensive operations of that important institution. A considerable addition to its labours has been incurred by the transfer to it of the observations of earthquake phenomena originated by the Vienna Academy of Sciences; this organisation embraces a large number of stations. Owing to this transfer the office has adopted the title of Central-Anstalt für Meteorologie und Geodynamik. A considerable increase has been made in the number of weather forecasts sent gratuitously to provincial post-offices; in these telegrams an attempt is made to forecast the weather for two days in advance. On the other hand, it has been found necessary greatly to restrict the amount of data published from stations of the second and third order; this materially lessens the bulk of the year-book. The investigation of the upper air by manned and unmanned balloons is actively continued, and the results are published in the Proceedings of the academy. A separate appendix contains a revision of the yearly means of barometric pressure at various stations since 1886, by Dr. Margueles, and a discussion of thunderstorms and hail, by M. Prohaska.

The results of meteorological and magnetical observations at Stonyhurst College for 1905 have just been issued. This useful observatory possesses photographic recording instruments both for meteorology and terrestrial magnetism, and was one of the seven principal stations included in the scheme of the Meteorological Committee in 1868 for the discussion of the meteorology of the British Isles; its observations extend over the long period of fifty-eight years. The most notable feature of the year appears to us to be the shortage of rainfall, amounting to just upon 8 inches. The total rainfall was 38·84 inches; the least fall in any year was 31·25 inches, in 1887. The prevailing wind was between south and west on 237 days. Drawings of solar spots and faculæ were made on 196 days, and the stellar spectrograph was employed on nearly every available night.

The fourteenth report of the Sonnblick Society for the year 1905 contains statistics of several prominent mountain meteorological stations, including an interesting account of the observatory at the summit of Monte Rosa, at an altitude of about 14,960 feet. The Sonnblick station (Salzburg) is about 10,190 feet above the sea-level, and is far from an agreeable residence for its enthusiastic observers. The mean temperature for the year 1905 was 19°·9 F.; the monthly mean was only above freezing point in July and August, the absolute maxima in those months being 56°·8 and 45°·7 respectively. Rain or snow fell on 230 days, amounting to 68·8 inches, and fog occurred on 274 days. On January 1 the thermometer fell to −35°·3, being the lowest observed since the establishment of the observatory, the next lowest reading being −30°·3, in March, 1890; the wind was north-easterly, with high barometric pressure (30·71 inches) over Scandinavia and low (29·53 inches) over Greece.

The twenty-eighth yearly report of the Deutsche Seewarte, for the year 1905, shows a considerable increase in the useful work of that institution; the number of sets of observations contained in ships' logs exceeded those of the previous year by more than 28,000. These observations are utilised in the publication of monthly charts for the North Atlantic, quarterly charts for the North Sea and Baltic, the preparation of valuable daily synoptic weather charts of the North Atlantic (in conjunction with the Danish Meteorological Institute), and various other investigations. Special mention may be made of the efficiency of the arrangements for the issue of weather forecasts and storm warnings, and of the careful discussion and publication of the observations made at distant stations, including Labrador, the South Seas, the Far East, and German East Africa. The exploration of the upper air by means of kites is actively carried on; 233 ascents were made during the year, the mean of the greatest altitudes being 3910 metres. It has been found necessary to limit the altitudes, except on the days of the international ascents, owing to the frequent loss of the kites; the principal kite (which carries the instruments) broke away on twenty-two occasions, three of which were due to lightning. Unmanned balloons also reached altitudes of 9 to 17 kilometres; the usual inversion of temperature generally occurred between 9 and 11 kilometres. A discussion of the results obtained will be published later on.

The annual summary of the India Weather Review for 1904, which completes the discussion of the meteorology of India for that year, was issued recently. This vast area is, as before, divided into eleven provinces and fifty-seven districts for the purpose of dealing with medical and agricultural statistics respectively. In addition to various tables giving the usual monthly and other values, each element is separately considered under seasons, including the hot, cold, and monsoon periods. We can here only briefly refer to some of the general annual results. The year was characterised by smaller departures from the normal temperature than is frequently the case; the mean of the maxima for the eleven meteorological provinces was 88°·0, of the minima 68°·7, and the mean daily range 19°·4. The Arabian Sea was singularly free from storms; only eleven occurred, and they were all comparatively feeble, and their tracks were less westerly than usual. The rainfall stations now number 2486; the mean amount of rainfall was 57·26 inches, about 1½ inches below the normal. On the Burma coast the fall was 152·65 inches, and in the Indus valley only 7·26 inches. During the year there was a marked increase in the number of sun-spots; the surface of the sun was not free from them on any day. Magnetic disturbances were recorded at Colába on 205 days, but there were only three days on which they were classed as "great."

The report of the Government Observatory, Bombay, for the year 1905 also quotes a remarkable deficit in the rainfall, it being stated as 41·5 inches below the normal of twenty-four years, 1873–1896. The total fall for the year was 33·66 inches only, and the amount for the previous year was 33·42 inches, both of which are record minimum falls, not even excepting that for the famine year, 1899, when 35·9 inches were registered. Milne's seismograph recorded thirty-seven earthquakes during 1905; those on April 4 and 9 and July 23 were very great disturbances. Plague in a severe epidemic form broke out at Alibág, but no cases occurred in the immediate vicinity of the branch magnetic observatory at that place; one case occurred at Colába in the month of April, notwithstanding that all precautions were taken.

The annual report of the Meteorological Department of the Transvaal for the year ended June 30, 1905, was received a few days ago. The central observatory, near Johannesburg, was first occupied in May, 1904, and is situated on an abrupt ridge of hills, nearly 6000 feet above sea-level. The department has been very active in supplying verified instruments, and has already some 250 stations in different parts of the colony, the majority of which record rainfall only; the observers are mostly volunteers, and receive no remuneration. The report, however, contains complete meteorological observations, or monthly results, for a considerable number of places, and very useful maps exhibiting the climatological features of the year in various districts. The diurnal periodicity of rainfall, so far as given, shows that the greater part occurs between noon and midnight. Nearly every fall of rain is