is fitted to compensate for local errors in each lead screw. Each tool, when sold, is accompanied by a certificate from the National Physical Laboratory as to its performance, and the certificate gives the errors found in a screw 8 in. long actually cut in the machine. The design of the machine, so far as can be determined from the drawings and photographs given in the article, is excellent, and the lathe should form a valuable addition to the equipment of gauge shops.

THE May issue of the Transactions of the Optical Society is devoted almost entirely to papers on the methods of design of telescopic objectives. Mr. P. F. Everitt sets out clearly in order of importance the six conditions which it is desirable that an objective, so far as is practicable, should fulfil. He then shows how, by the help of tables such as those of Smith and Cheshire, the approximate radii of the surfaces of the objective are found, and corrected by tracing the paths of an axial and an edge ray through the system. Mr. T. Smith gives an account of the methods in use at the National Physical Laboratory which have furnished the tables just mentioned, and Mr. S. D. Chalmers gives an alternative method of making the calculation. In the discussion of the three papers Prof. Cheshire emphasised the importance of accurate computation of the properties of an objective before the manufacturer put tool to glass. We cannot in modern times wait for a sample to be made and tested before producing instruments in quantity. Mr. Conrady and Mr. Hasselkus contended that an objective should be designed to compensate the errors of the common eye-pieces, while Mr. Everitt declined to saddle the objective with this task.

MR. C. TURNBULL read a paper to the Institution of Electrical Engineers on May 9 in which he urged the necessity of having a "national proving house" for testing British engineering apparatus and materials. Although most of the speakers agreed with Mr. Turnbull, no one advanced any real proof that there was any urgent necessity for a commercial laboratory of this kind. We are not aware that there is any appreciable quantity of inferior apparatus or shoddy electrical materials in the market. The president, Mr. C. H. Wordingham, in opening the discussion, gave a summary of a report of the committee of the council which had been considering the subject. He began by saying that the proving house would not enter into competition with existing institutions, but it will be difficult to avoid doing so. It will be remembered that when the National Physical Laboratory was started this consideration caused considerable friction. As a proving house will have to be largely, if not altogether, self-supporting, little research work can be undertaken. Sir Richard Glazebrook welcomed the suggestion that the proving house should work in conjunction with the National Physical Laboratory. The experience of the working of the National Board of Fire Underwriters of the U.S.A., which has what is practically an electrical proving house, shows, however, that the main problems it is forced to consider are political, commercial, and international rather than scientific. Hence it may be advisable to leave the problems of a British national proving house to the engineers' and manufacturers' associations, as they are free to deal with such questions. Unless a much stronger case can be made out for it, the whole proposal will probably fall through.

IN the Kjeldahl method for the estimation of nitrogen in organic compounds the substance is usually—in fact, almost invariably—digested with the sulphuric acid until a clear, transparent liquid is obtained. With some substances, *e.g.* indiarubber, a very prolonged period of digestion is thereby rendered necessary. Mr. Matthew Howie finds, however (Journal of the Society of Chemical Industry, March 30), that the whole of the nitrogen present in rubber is converted into ammonia in less time than is required to effect the complete dissolution of the substance. Using samples of plantation sheet and of Manihot rubber, it was found that 80 per cent. to 94 per cent. of the nitrogen was converted into ammonia after one hour's digestion, whilst three to four hours' digestion gave as high a nitrogen value as the six hours necessary for complete clarification of the solution. It is possible that in the case of other highly resistant nitrogenous substances the Kjeldahl estimation might be similarly shortened.

OUR ASTRONOMICAL COLUMN

MAY METEORS.—Between May 17 and 24 meteors have occasionally been abundant and given evidence of several well-defined showers. Whether or not this period is worthy of special note cannot be absolutely affirmed, though the evidence strongly suggests that it needs further investigation. This year some fine meteors were observed at Bristol on the mornings of May 18 and 19, and proved that several of the various systems which mark this epoch returned with tolerable strength.

In 1866, May 18, several of the assistants of the Royal Observatory, Greenwich, remarked a striking prevalence of bright meteors, and Mr. Denning found on projecting the roughly observed paths that the radiant was placed at 247°+32° near ζ Herculis. This shower was observed at Bristol in 1903, 1911, and a few other years, and from a general investigation of all the meteor tracks recorded at the latter station since 1875 during the period May 17–24 the following radiants seem well defined:—

° °	° °	° °	° °
194+57	245+62	280−13	312+61
223+41	248+29	280+31	316+31
227− 6	254−21	290+60	331+50
230+33	263+37	291+52	332+71
231+27	270+47	294± 0	334+58
241+48	273+22	311+80	354+40

Many periods of the year appear to be more noteworthy for the large number of streams visible than for the special richness of one or two.

DISTANCE OF THE PLEIADES.—Prof. W. H. Pickering has made a further application of the statistical method to the determination of the distance of the Pleiades (Harvard Circular, No. 206). Absolute magnitudes were calculated by Russell's formula $M=0{\cdot}6+2{\cdot}1(T-2)$, where M is the absolute magnitude and T the type of spectrum, counting B as 1, A as 2, F as 3, G as 4, and K as 5. The eighty-two stars considered range in type from B5 to A9, and, omitting the six brightest stars as being possible "super-giants," the average difference between apparent and absolute magnitudes is 6·46. This corresponds with a distance of 201 parsecs, or 656 light-years, the parallax being $0{\cdot}0050''\pm0{\cdot}0008''$. It thus appears that the Pleiades are about five times as remote as the Hyades, while the distance between the two farthest apart of the bright stars (63′) is 12 light-years. The brightness of Alcyone is estimated to be 2100 times that of the sun, while the other five bright stars average about 800 times as bright as the sun.

By the same method Prof. Pickering finds 301 light-years, or a parallax of $0{\cdot}0109''\pm0{\cdot}0026''$, for the Coma Berenices cluster.

THE SPECTROSCOPIC BINARY 42 CAPRICORNI.—The variable radial velocity of this star was shown in

two photographs taken by Dr. Lunt at the Cape Observatory in October of last year, and data for the computation of a provisional orbit were provided by fifteen plates taken later (*Astrophysical Journal*, vol. xlvii., p. 134). The magnitude of the star is 5·28, and the spectrum of type K. The semi-amplitude of the velocity curve is 22·75 km./sec., and the system is approaching with a velocity of 3·0 km./sec. relatively to the sun, or receding at 7·3 km./sec. when the component of the solar motion is eliminated. The star is of special interest, inasmuch as the period is only 13·25 days, whereas Campbell found no spectroscopic binaries of the later types G, K, and M having periods less than twenty days.

THE TOTAL SOLAR ECLIPSE OF JUNE 8, 1918.

THE "Eclipse Number" of *Popular Astronomy* (vol. xxvi., No. 5, May) gives special prominence to a number of articles on the approaching total eclipse of the sun visible in the United States. Prof. H. C. Wilson gives a general account of eclipse phenomena and of the circumstances of the eclipse of June 8, to which is appended a series of letters indicating the plans of leading astronomers for observing the eclipse. The shadow first strikes the earth in the Pacific south of Japan, then passes north-westward, and reaches its highest latitude about 500 miles south of the Alaskan coast in long. 152° W.; on its landward course it passes from the western coast of Washington by way of Denver to Florida, the duration of totality on the central line gradually diminishing from 121 to 50 sec. Quite a large number of American astronomers are too fully occupied with war-work to undertake observations, but several well-equipped parties will occupy stations along the track. Ample provision appears to have been made for direct photographs of the corona on large and small scales, as well as for spectroscopic observations, and some of the observers will make special efforts to obtain photographs suitable for testing the deflection of rays of light from stars near the sun which is predicted by Einstein's theory of relativity. Prof. Hale will be in Wyoming with a party from the Mt. Wilson Observatory, and will attempt to determine the rotation of the corona from displacements of the green coronal line, besides obtaining photographs for studies of the chromospheric spectrum at different levels. Prof. Campbell's programme is somewhat restricted by the delay in the return of the instruments employed by him in Russia in 1914, but some instruments are available for photographs of the corona and of its spectrum.

The observations proposed by Prof. Abbot include measures of the brightness of the sky and of the outgoing radiation before, during, and after the eclipse. Prof. Stebbins will endeavour to secure photometric measures of the corona by means of potassium and rubidium photo-electric cells. A large party from the U.S. Naval Observatory will be located at Baker, Oregon, and, in addition to many other observations, will attempt to extend the spectroscopic observations into the extreme red by the use of plates stained with dicyanin. Profs. Frost and Barnard have also prepared an extensive programme of photographs of the corona and its spectrum at Green River, Wyoming. In a separate article Prof. Frost directs attention to the valuable observations of the chromospheric spectrum which are possible at places within 200 miles of the eclipse track, as indicated by Newall and Fowler in 1912.

On account of the war, it is not expected that there will be any expeditions from foreign countries to observe this eclipse.

DIURNAL VARIATION OF ATMOSPHERIC PRESSURE.

THE effect of geographical latitude on the semi-diurnal wave of atmospheric pressure is fairly regular and well marked, but the variation of the diurnal wave has attracted less attention since Angot in 1887, and also Hann, showed conclusively its dependence on secondary local conditions. Three Japanese investigators from the Geophysical Seminary of the Physical Institute, Tokyo, contribute an account[1] of a preliminary attempt to trace more definitely the mechanism of these local influences, one of the most obvious of which, under the name of "continentality," has recently been attracting the attention of Mr. C. E. P. Brooks in this country in connection with climate, and with a purely geographical theory of the Ice age.

The elementary definition of continentality as the percentage of land in a circle of definite size (say 10° radius) surrounding the station is clearly insufficient, so much depending upon the orientation and shape of the coast line or lines that the form of the function is bound to be complicated. The Japanese authors soon come to the conclusion that it is not linear, and are constrained to make a series of simplifying assumptions in order to reach a workable hypothesis. The assumptions are no more probable than those of the early days of the theory of tides, with which the present problem has obvious analogies.

With these limitations the authors appear to account for such features as the variation with longitude, the inversion of phase near the poles, and the minimum amplitude near the coast, but a general solution of the problem has evidently not yet been reached. They indicate the lines on which they propose to continue the investigation, and conclude with a representative set of daily variation curves for ten British observatories, showing considerable dissimilarity, those of Oxford and Aberdeen, for instance, being almost the converse of each other. A systematic series of stations within the Empire, chosen with special reference to the elucidation of this problem, may well form part of the programme of co-ordinated British Empire meteorology so strongly advocated by Major Lyons in his presidential address to the Royal Meteorological Society.

The barometric variations dealt with in the above paper, as generally studied, are naturally to be regarded as vertical oscillations of the free atmosphere, though there is a possible difficulty in the differentiation between statical and dynamical pressure, when an ascending or descending current is in question. But there is also a very decided horizontal oscillation or motion of the free atmosphere, and this has begun to attract attention since the use of pilot balloons has provided more information about the direction of the wind at different heights than can be inferred from the motion of clouds. A paper from Batavia[2] has appeared in the Proceedings of the Royal Academy of Amsterdam dealing with the semi-diurnal variation of this motion.

There is a good deal of uncertainty about the investigation, even in a favourable place like Batavia, where atmospheric conditions are as a rule very quiet and steady. Observations were made not only at Batavia, but also at a neighbouring mountain station of 3000 metres elevation, as well as from a small coral island, to eliminate the land-effect. Single observations are

[1] "On Diurnal Variation of Barometric Pressure." By T. Terada, M. Kiuti, and J. Tukamoto. Journal of the College of Science, Imperial University of Tokyo, vol. xli., art. 1 (November 20, 1917).

[2] "The Semi-diurnal Horizontal Oscillation of the Free Atmosphere up to 10 km. above Sea-level Deduced from Pilot-Balloon Observations at Batavia." By W. van Bemmelen and J. Boerema. Proceedings Royal Acad. Amsterdam, vol. xx., pp. 119–35+plate.