Our Astronomical Column.

OCCULTATION OF A STAR BY SATURN.—Bad weather prevailed generally in Europe on March 14, when Saturn occulted the star Leipzig I 4091, mag. 7·6. A few observations were, however, secured, some of them being published in *Astr. Nach.*, 5042. Prof. Plassmann observed the disappearance at Munster, noting that at 7h. 3·0m. G.M.T. the star was still separated from the limb, at 7h. 5·1m. it was in contact with it, while at 7h. 5·9m. the star had disappeared.

Messrs. K. Novak and V. Rolcik, observing at Smichow, long. oh. 57m. 38s. E. Gr., lat. 50° 4′ 42″ N., noted the reappearance at 8h. 39m. 40s. G.M.T.

Dr. Bernewitz, at Berlin-Babelsberg Observatory, first saw the star at 8h. 39m. 34s. G.M.T. He noted that at 8h. 39m. 51s. it appeared of full brightness, and at 8h. 40m. 5s. the centre of its disc was distinctly separated from the limb. He states that the marked red colour of the star made it easy to distinguish its light from that of the planet. He made the only observation so far to hand of the appulse of Titan to the star, which occurred some four hours after emersion from the planet. He states that Titan did not occult it, but passed 1″ or 2″ to the north of it.

The extreme accuracy of Mr. Burnet's prediction is noteworthy. He gave 7h. 5m. for the disappearance, and 8h. 40m. for the reappearance. Owing to the slowness of Saturn's motion, he thought it likely that these times would be in error by several minutes.

THE EINSTEIN DISPLACEMENT OF SPECTRAL LINES.—The *Observatory* for April contains communications on this subject by Messrs. J. Evershed and C. E. St. John. The former gives reasons for thinking that the pressure in the photosphere is extremely low, so that pressure may be eliminated as a disturbing factor. Using forty-two iron lines, selected as not subject to pole effect, he obtains a shift equivalent to a recession of 0·643 km./sec. at the sun's centre and 1·000 at the limb. But observations of Venus at various elongations support the idea that this is not an Einstein effect, but a shift of all regions of the sun away from the earth. It is remarked that it is difficult to accept this as a physical reality, but no other explanation has yet been found. He notes that some of the carbon lines give an effect similar to the iron ones, but somewhat smaller. The effect seems to vary for different substances, and even for different lines of the same substance, so that some modifying influence is at work.

Mr. St. John recapitulates his well-known investigation, in which he used certain lines of the cyanogen band; he then describes his recent work on magnesium and iron lines. He finds from their weighted mean a displacement of the same sign as the Einstein prediction, but of only one-third or one-fourth of its amount. Mr. St. John notes, however, that the displacement varies with the intensity of the lines, being greatest for lines either of very great or very small intensity. As the majority of the lines measured are of medium intensity, the weighted mean is reduced. He also notes that no lines have been used which seemed unsuitable for the purpose, owing either to their proximity to others or to their instability in the arc spectrum.

STELLAR SPECTROSCOPY AT THE DETROIT OBSERVATORY.—Vol. ii. of the Publications of this observatory, belonging to the University of Michigan, has lately been distributed, and contains a great number of interesting studies of stellar spectra. Two may be instanced in particular: the study of variable stars of Class Md, by Mr. Paul W. Merrill, traces the changes of spectra that accompany the change of light, and discusses various suggestions of the cause of variability. The one favoured by the author is somewhat analogous to the "geyser" theory, but, instead of imagining a solid or viscous crust imprisoning the gases within, he substitutes a smoke-veil composed of condensing gases (calcium is especially suggested) in the upper regions of the stellar atmosphere. This would act as a screen confining the heat of the photosphere, until the accumulation of heat sufficed to vaporise the screen. When the solid-crust theory was propounded these stars were thought to be near the end of their careers as suns, but from the smallness of their proper motions it now appears that they are mostly giants.

The other paper, by Mr. Laurence Hadley, deals with the elements of ζ′ Ursæ Majoris, the first spectroscopic binary discovered. The orbit is fully discussed from several series of observations. The period is 20·53644 days, the eccentricity is 0·518, and the masses of the components $\times \sin^3 i$ are respectively 1·83 and 1·79 in terms of the sun. It is noted that Prof. Joel Stebbins finds no evidence of light variation.

Meteorology at Hong-Kong.

MONTHLY Meteorological Bulletins for the Royal Observatory at Hong-Kong for a considerable period to August, 1919, have recently been received. They contain detailed results of observations made at the observatory and the daily weather reports from various stations in the Far East, prepared under the direction of Mr. T. F. Claxton. For Hong-Kong hourly values are given of barometric pressure, temperature of the air and evaporation, direction and velocity of wind, amount of rainfall, and duration of sunshine. All the hourly observations are measured from the self-registering records. Three-hourly observations are made of the character and direction of motion of the clouds. Daily values are also given of the several meteorological elements. The normals used for comparison with the means are for the years 1884 to 1918, a period of thirty-five years. From 1916 the daily and mean hourly values of the principal meteorological records have been published in both C.G.S. and British units, and with the January Bulletins tables are given for the conversion of the several elements to the respective units. Information is also supplied for the reduction and correction of the instrumental observations. The December Bulletins give tracks of typhoons and depressions in the Far East for the year, and the divergence in the several months is well shown. With the Daily Weather Reports, which contain observations from forty-five stations in the Far East, notices are given of the warning to coast ports, which commonly state the position of typhoons when such are in progress, and forecasts are given daily for the twenty-four hours ending at noon.

The annual report for 1917 contains a comparison of the Beckley anemograph with the Dines instrument, extending over eight years; the differences are remarkably consistent until the summer of 1917, when for some unexplained reason, although noticed, the differences vary. A Richard dry- and wet-bulb thermograph has been set up to replace the Kew photographic thermograph. In section ix. reference is made to sympiesometer observations, and hourly observations are said to have been made for upwards of a year to test the popular belief in the sympiesometer as a weather forecaster. The remarks scarcely seem to refer tc a sympiesometer, which was essentially a sailor's barometer in the first half of the nineteenth century It seems rather that the instrument tested

is a camphor glass or chemical weather glass, long acknowledged to be of no real scientific value. The report for 1918 deals with the corrections to be applied to the readings of an unaspirated wet-bulb thermometer in an "Indian" shelter to reduce them to those of an aspirated thermometer at definite wind velocities and for different depressions of the wet bulb. With the lighter wind velocities, of 1–5 m.p.h., and for the larger depressions of the wet bulb, say amounting to 6°–10°, the subtractive correction to the unaspirated wet bulb amounts to 1° or slightly more. Three thousand three hundred and seventy-five observations have been dealt with, but as yet no definite scheme has been decided upon. The matter has been considered in correspondence with the British Meteorological Office.

Milk Production of Ayrshire Cattle.

THE critical genetic study of a character such as that of milk production in cattle, which is highly subject to environmental influences, cannot be carried out effectively until a fairly comprehensive knowledge of the normal variation of the character has been acquired. To this end Prof. Raymond Pearl and Mr. J. R. Miner have carried out a biometrical analysis of the normal individual variation in the milk flow and the fat content of the milk of Ayrshire cattle, the results of which are summarised in a contribution to the *Journal of Agricultural Research* (vol. xvii., No. 6). Their study is based on the records of Ayrshire cattle for the years 1908 and 1909 published in the reports of the Ayrshire Cattle Milk Records Committee of Scotland, more than three thousand records in each year being used for the purpose. Amongst the many important conclusions arrived at mention may be made of the indications that about one-half of the observed variation in milk-production results from the varying genotypic individuality of the animals with respect to this character, the remainder resulting from varying environmental influences. The udder as a secreting organ is compared with the oviduct of a hen, and it is shown that the latter operates with somewhat less variability than the former, having regard to the absolute weight of the product in the two cases.

The change in mean weekly yield of milk with advancing age is found to be represented by a logarithmic curve, the absolute amount of milk produced per unit of time increasing, though at a decreasing rate, with the age of the cow to a maximum, which was found to be when the cow is ten to eleven years old. The mean fat percentage of the milk was found to decline with advancing age until the tenth year of the cow's life, after which it remains about constant.

The Ignition Points of Liquid Fuels.

IN a paper read before the Institution of Petroleum Technologists on January 20, Mr. Harold Moore described a number of determinations of the ignition point of commercial fuels which are, or might be, used in internal-combustion engines. His ignition meter, somewhat similar in principle to that designed by Holm, consists of a steel block, heated from below, in the upper surface of which a hollow is made to take a crucible of platinum, nickel, or quartz. The air or oxygen supply passes through a hole in the block before entering the crucible, so as to pre-heat it to the temperature of the crucible, which is given by a resistance thermometer placed in a hole drilled in the block near the crucible. A cover to protect the crucible from draughts is screwed on to the block, and a drop of the liquid fuel is introduced through a hole in this cover and falls on to the bottom of the crucible. After an interval, more or less prolonged, an explosion is heard and a flame seen if the temperature is above the ignition point. This interval may be as long as thirty seconds or more, and there is no doubt that quiet combustion takes place during this period, and such combustion is very marked in the case of ether. On the other hand, the evaporation of the drops of liquid must produce local cooling, and, unless the fuel is quite homogeneous, the ignition point found must in many cases be that of the last portion to evaporate.

But, in spite of certain inherent defects, the method gives a valuable comparative test of different fuels—a test which is quick and easy to apply.

Mr. Moore recommends the use of ordinary compressed oxygen instead of air as giving more concordant results and as having a concentration at atmospheric pressures more nearly like that used in motor engines. Most hydrocarbon liquids tested in air gave ignition points from 100° C. to 200° C. higher than in oxygen; but, curiously enough, Mr. Moore found that in an atmosphere containing 70 per cent. of carbon dioxide and 30 per cent. of oxygen the ignition point of kerosene was almost the same as in pure oxygen. A few ignition points from Mr. Moore's lists may be quoted:

Ignition Point.

Fuel	In oxygen °C.	In air °C.
Taxibus spirit (Anglo-American Oil Co.)	272	396
Anglo-Persian oil	254	408
Anglo-Mexican oil	259	417
Normal hexane	287	—
Benzene	620	—
Ethyl alcohol	395	518
Ether (methylated)	190	347
		In silica crucible
Hydrogen	—	678

In the case of mixtures of two liquids of very different ignition points the addition of about 20 per cent. of the more easily inflammable liquid suffices to reduce the temperature substantially to that of the lower constituent; for instance, the addition of 20 per cent. of ether (ignition point 206°) to xylol (ignition point 555°) reduced the ignition point of the mixture to 246°

Naval Research and Experiment.

TO ensure that the full benefits of science shall be secured to the Naval Service, a Department of Scientific Research and Experiment has been set up under the Third Sea Lord and Controller. As the Scientific Adviser of the Admiralty, and in charge of this Department, Mr. F. E. Smith, F.R.S., has been appointed with the title of Director of Scientific Research. It is the duty of the Department to keep the Navy in touch with outside scientific establishments and to ensure that the work at the various naval experimental establishments proceeds with full cognisance of scientific progress and methods. The Director of Scientific Research will work in close association with the Naval Staff, thus ensuring that naval policy is framed with due consideration of the possible practical applications of scientific progress in relation to naval needs, and enabling requirements as to types and weapons to be formulated with a knowledge of the latest scientific possibilities.