Our Astronomical Column.

COMMENCEMENT OF THE GREAT PERSEID SHOWER OF METEORS.—The first Perseids probably appear at the end of June. They have certainly been observed in the first week of July. The earliest meteor of this shower, which has been doubly observed and the real path of which has been computed, was seen on July 8, 1918, by Mrs. Fiammetta Wilson and Miss A. Grace Cook. This year the moon left the evening sky about July 6, and the sky should be watched for traces of oncoming Perseids. At this time of the year meteors generally increase in numbers, and especially after the middle of July. The Perseids gradually become more abundant, and among the minor displays the chief ones are:

δ Aquarids	...	338−11	o Draconids	...	291+60
α Capricornids	.	303−11	λ Andromedids	.	350+51
θ Cygnids	...	292+52	ζ Pegasids	...	332+10
α Perseids	...	48+44	β Cepheids	...	333+71
α Cygnids	...	315+48	Lacertids	...	334+51

The radiant point of the Perseids moves N.N.E. as follows:—

July 8	...	9+46	Aug. 1	...	33+55
16	...	16+49	9	...	43+57½
24	...	24+52	17	...	54+59

THE EXPANDING DISC OF NOVA AQUILÆ.—Dr. Lunt contributed a paper on this nova to the June meeting of the Royal Astronomical Society which contains some interesting calculations on the rate of expansion. It was written before the recent Lick measures, which indicate a mean annual rate of increase of diameter of 1·9″, but he notes that Barnard's measures gave an increase of 2″ in the first six months, so that the rate may be diminishing.

Assuming the displacements of the edges of the bands in the spectrum to be a measure of the rate of expansion of the nova into a planetary nebula, Dr. Lunt found a radial velocity of 1500 km./sec., which would give a diameter of 1/100 light-year in a year, and would imply a distance of the nova of 1000 light-years.

According to Van Maanen's parallax of the ring nebula in Lyra (the largest nebula on his list), its diameter is 0·16 light-year. The expanding nova would attain this size in sixteen years if the rate were maintained.

Dr. Lunt notes that in the nova spectrum there are fine dark lines close to the normal positions of the H and K lines of calcium, which indicate a motion of approach to the sun of 17 km./sec., exactly the amount due to the sun's own motion. A similar feature has been noted in several other stars, and the suggestion made that these lines arise from clouds of very tenuous calcium vapour at rest in space. On this view these lines exist in the spectra of most stars, but are hidden by the star's own lines unless the latter are shifted by a large radial motion.

THE NEW MINOR PLANET GM.—It will be remembered that last January Señor Comas Sola, of Barcelona, discovered a new minor planet which was much brighter than most of those discovered in recent years, and was taken for a comet by some observers. The object was very well observed for several months, so that an accurate determination of the orbit is possible, and there is not much fear of its being lost again, as has happened to many of these little planets. The discoverer has now given it the name "Alphonsina," in double homage, as he says, to Alphonso X. of Spain, who was known as "the Savant," and to the present king, Alphonso XIII.

Annual Visitation of the National Physical Laboratory.

ON the occasion of the visitation of the National Physical Laboratory by the General Board on June 22, a large number of distinguished visitors availed themselves of the opportunity of inspecting the laboratory. The visitors were received by the chairman of the board (Sir Joseph J. Thomson) in the 7-ft. wind channel of the new aeronautics building, and afterwards visited the various departments of the laboratory, where exhibits illustrative of recent work were on view.

The exhibit in the engineering department was noticeable for the large number of machines for testing resistance to shock and to fatigue. The day is past when a simple test in tension is considered to yield sufficient data for structural material, and many other forms of test are now in use. One machine, designed by Dr. B. Haigh, subjects the specimen, by means of an alternating magnetic flux, to a maximum load of ±0·75 ton reversed two thousand times every minute. Another instrument, designed and constructed in the department, tests the endurance of stranded cables passing over pulleys. Among the impact testing machines, many of which were designed and made in the department, mention may be made of one in which both hammer and anvil are swung; by this means it is possible to obtain a striking velocity as high as 43 ft. per second. Machines for measuring the elastic limits of materials at high temperatures and for determining the efficiency of chains, gears, etc., were also among the exhibits.

In the aeronautics department various wind channels were operating, measurements of the performance of air-screws, the effects of aeroplane bodies on screws, and stability tests on bodies being carried out. Apparatus for measuring the skin-friction of air passing over thin plates was also exhibited.

Amongst the exhibits in the metallurgy department were a number of examples of failures of steel and alloy articles which had been sent in for investigation. Photomicrographs illustrating sections from these, as well as various sections under the microscope, were shown.

The representation of the constitution of a series of ternary alloys has never been an easy matter. Three models were exhibited which are designed to overcome this difficulty. They represent parts of the "diagram" for copper-aluminium-zinc alloys and a part of the aluminium-magnesium-silicon "diagram."

Considerable improvement has recently been introduced into the manufacture of thin-walled refractory tubing for thermo-couple protection and insulation; the apparatus with which it is made was shown in operation.

Demonstrations of the rolling of manganin, cast at the laboratory, into rods prior to wire-drawing were given in the rolling mill. Much valuable work has been done, in conjunction with the electricity department, on this metal, and it is now possible to produce manganin wire equal to the best pre-war material which was imported from Germany.

A modified form of the Shakespeare katharometer, used for measuring the permeability of balloon fabric, was in operation in the aeronautical chemistry division.

The exhibits in the Froude national tank can be divided into three heads. The first dealt with tests on the trim, the longitudinal stability, and the resistance of hulls of flying-boats. The second was work which was being carried out for Lloyd's Register in

connection with the design of oil-tankers to determine the stresses in the bulkheads of the oil compartments when the ship is pitching. The effect of varying the frequency of the pitch was studied. Thirdly, an apparatus was shown for testing the effects of a screw propeller working behind a ship. If we know the thrust which the screw must develop, and the velocity of the water behind the ship where the screw is working, relative to the velocity of the ship, then the ordinary data can be used to find the dimensions of screw required for a particular service. The object of the experiments is to find out these two factors.

The heat division of the physics department exhibited, amongst other things, a method of measuring humidity based on the property, shown by dry cotton, of absorbing moisture at a very high rate. Two similar coils of cotton-covered wire, one of which is coated with cellulose, are wound on to a single bobbin and connected up to the two sides of a Wheatstone bridge. They are dried by being inserted into a tube containing P_2O_5, a current being passed through them at the same time to ensure complete drying. The coils are then drawn out of the drying tube into the atmosphere the humidity of which is to be measured; the cotton on the uncoated wire absorbs moisture with extreme rapidity, which causes a rise in temperature of the wire, thus upsetting the balance of the bridge and deflecting the galvanometer.

Another exhibit consisted of a pointolite lamp for calibrating optical pyrometers. The special feature of this instrument is that the tungsten disc had a tungsten-molybdenum couple fused into it, by means of which it was possible to measure the temperature of the disc.

In the optics division of the physics department an apparatus was shown for measuring the coefficient of expansion of short specimens. It has been used lately for determining the coefficient of expansion of various glasses, and has given very interesting results. Interferometer tests and methods of measuring refractive indices were also shown.

One of the most interesting exhibits in the metrology department was a machine which was constructed to measure accurately to one-millionth of an inch. Slip-gauges are now made accurate to 1/100,000 in., and to test them it is advisable to have a machine which can read to one-tenth of this. The machine is used as a comparator, *i.e.* it measures the difference between the standard gauge and the one under test. The chief feature of the instrument is the complete absence of a micrometer head. The magnification is obtained partly mechanically, but mainly by a tilting mirror, which moves the image of a cross wire over a paper scale, giving a magnification such that a movement of $\frac{1}{4}$ in. over the scale corresponds to a difference in length of 1/100,000 in.

Another machine, for comparing end standards with line standards, can be used for lengths up to a metre. An important point about this instrument is that the two standards under comparison are in the same straight line.

A new type of micrometer for measuring the diameter of small balls, rollers, etc., was also shown, in which the readings are made on two parallel circles, one of which drives the other through epicyclic gearing; tenths and hundredths of an inch are read on one circle, and thousandths, ten-thousandths, and, by estimation, hundred-thousandths on the other. Both sets of readings are in line with each other, making the instrument very rapid to read. The position of contact is found by means of a small mirror moved by the tail-stock of the instrument.

The list of exhibits in the electricity department was large and interesting, but there is only space for reference to a very few of them. A considerable number dealt with photometry. Others were concerned with the temperature coefficient of manganin, with the measurement of frequency, efficiency, amplifying power, and characteristics of electric valves, and with a selenium-cell current regulator.

The Carnegie Foundation and Teachers' Pensions.[1]

TEACHERS' pension controversies are not confined to England. All our recent discussions of this subject have their counterparts in the United States, but there they are immensely complicated by the lack of co-ordination between the different States of the Union. Great diversity exists between the school pension systems which have been adopted or are under consideration, and no attempt seems to be made to bring them into relation one with another.

The universities and colleges (or such of them as are admitted into association) are the special province of the Carnegie Foundation for the Advancement of Teaching, and the fourteenth report of this body contains evidence of work of great value. Beginning in 1905 with an initial benefaction of ten million dollars, the endowment administered by the trustees has been increased by later gifts and accumulated interest to more than twenty millions. The object of the founder was to provide retiring pensions for teachers in universities, colleges, and technical schools in the United States, Canada, and Newfoundland "without regard to race, sex, creed, or colour"; but the granting of pensions does not by any means represent the whole of the activities of the trustees. To enable them to discharge effectively the duty laid upon them, they have felt compelled to conduct many inquiries and, when necessary, to offer fearless criticisms, and by these means they have undoubtedly exercised a powerful influence on the quality of higher education in America.

During the year 1918–19 the trustees disbursed in retiring and widows' allowances a sum of more than eight hundred thousand dollars. But in that year the old plan of granting such allowances was definitely abandoned in favour of a scheme under which the teacher himself is called upon to contribute towards the provision for his own retirement. It is of special interest to observe that, at the time when we in this country were adopting for school-teachers a national pension system on a non-contributory basis, which many university teachers wish to be extended to themselves, the Carnegie Foundation had come to the conclusion, as a result of thirteen years experience, that a "free pension" could not be a solution of the problem in a democratic country, but that the system must be contractual and rest upon the co-operation of the teacher and his college. This method, in the opinion of the trustees, is the only one that is "just, feasible, and permanent." To this end they organised a Teachers' Insurance and Annuity Association, in the control of which the teachers themselves will have real representation, and invited the universities and colleges to adopt pension schemes based on joint contributions by the teacher and his institution and worked by means of policies issued by the new association. The trustees continue the system of free pensions for those who were in the service of associated institutions before a certain date, but for others will content themselves with the pro-

[1] Carnegie Foundation for the Advancement of Teaching. Fourteenth Annual Report of the Chairman and of the Treasurer. (New York, 1919.)