there is a mountain called Charchani, about 20,000 feet high; an observatory was established just below the snow-line, at the height of 16,650 feet, in the years 1892–3, but is now abandoned. The article contains a graphic account of the difficulties of establishing two observatories on Mont Blanc, one at 14,320 feet, and the other on the summit, at 15,780 feet, by M. Vallot and M. Janssen, respectively. The meteorograph for the summit of Mont Blanc has been constructed by M. Richard at a cost of £750, and the clockwork is calculated to remain in action for eight months.

USEFUL and practical publications continue to issue from the various botanical experiment stations in the United States. We have on our table the following:—From Kansas State Agricultural College, *Bulletin* No. 50, comprising a list of Kansas weeds, with descriptions, and figures of the seedling forms; from Cornell University, an essay, by Mr. G. F. Atkinson, on "Damping Off," containing a description, with figures, of the various parasitic fungi which accompany this phenomenon, including a new species, *Volutella leucotricha*; and "Studies in Artificial Cultures of Entomogenous Fungi," by Mr. R. H. Pettit, also illustrated by plates.

THE Report of the Botanical Exchange Club of the British Isles for the current year is issued, with a list of Desiderata. The main portion of the very useful work done by this Association rests with two or three individuals. This work would be greatly promoted by the addition of a few new subscribers, who should address themselves to Mr. Charles Bailey, College Road, Whalley Range, Manchester.

THE following colonial botanical publications have reached us:—The *Bulletin* of miscellaneous information of the Royal Botanic Gardens, Trinidad, for July, containing a number of notes on native and cultivated plants in the colony, by Mr. J. H. Hart; *Botany Bulletin*, No. 10, of the Department of Agriculture, Brisbane, consisting of contributions to the Queensland flora, by Mr. F. M. Bailey; *Proceedings* of the Royal Society of Queensland, vol. xi. pt. 1, with the annual address of the President, Mr. R. L. Jack, on "The Higher Utilitarianism."

MESSRS. G. PHILIP AND SON have reprinted for Dr. Mill the paper on "The English Lakes," which, under the title of "On the Bathymetrical Survey of the English Lakes," the author contributed to the July and August numbers of the *Geographical Journal*. The book is nicely got up, and is illustrated by numerous photographic views, maps, and diagrams.

A NEW edition—the third—of Clowes and Coleman's "Quantitative Chemical Analysis" has been sent to us by Messrs. J. and A. Churchill. The work has undergone certain changes since the publication of the second edition, the matter having been increased, the text revised, and some new figures added.

THE September part of *Science Progress* contains the following articles:—"Progress in the Study of the Ancient Sediments," by J. E. Marr; "On the Respiratory Function of Stomata," by F. Frost Blackman; "The Zoological Position of the Trilobites," by H. M. Bernard; "Some Metasomatic Changes in Limestones," by A. Harker; and "The Decomposition Products of Proteids," by Dr. T. Gregor Brodie.

THE series of small books, entitled "Encyclopédie Scientifique des Aide Mémoire," which is being brought out conjointly by Messrs. Gauthier-Villars and G. Masson, of Paris, has had another addition made to it by the publication of "Cubature des Terrasses et Mouvement des Terres," by G. Dariès.

THE paper "On the Cost of Warships," which was read by Dr. F. Elgar at this year's summer meeting of the Institution of Naval Architects, has been issued in pamphlet form by the Institution. The pamphlet also contains a report of the discussion on the paper which took place at the meeting.

WE have received the *Memoirs and Proceedings of the Manchester Literary and Philosophical Society*, fourth series, vol. ix., No. 3, 4, and 5, and the *Journal of the Asiatic Society of Bengal*, vol. lxiv., part 2, No. 2.

MR. R. W. PAUL, of Hatton Garden, has sent to us advance sheets of his new catalogue of electrical testing and measuring instruments. Many of the instruments are figured.

THE University Correspondence College has issued its Intermediate Arts Guide, No. x., with the papers set at London University, July 1895, and articles on the special subjects for 1896, and its London Inter. Science and Prel. Sci. Guide No. vii., with the papers set at London University, July 1895.

THE August numbers of the *Journal of the Royal Microscopical Society* and of *Clinical Sketches* have reached us; also part vi. of the *Katalog der Bibliothek der Kaiserlichen Leopoldinisch-Carolinischen Deutschen Akademie der Naturforscher*, Halle; and Messrs. Friedländer and Söhn, Berlin, have sent us No. x. to xiv. of *Naturæ Novitates*.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*, ♂) from India, presented by Miss E. S. Cooper; a Smith's Dwarf Lemur (*Microcebus smithi*) from Madagascar, presented by Miss Ruby Woolcott; a Yellow-fronted Amazon (*Chrysotis ochrocephala*) from Guiana, presented by Mr. W. Page; a Beautiful Grass Finch (*Poephila mirabilis*, ♂) from Australia, presented by Mr. Gerard O'Shea; a Brazilian Tortoise (*Testudo tabulata*) from Brazil, deposited; three Boas (*Boa constrictor*) from Brazil, purchased; a Wapiti Deer (*Cervus canadensis*, ♂), two Triangular-spotted Pigeons (*Columba guinea*), a Spotted Pigeon (*Columba maculosa*), two Crested Pigeons (*Ocyphaps lophotes*), two Half-collared Doves (*Turtur semitorquatus*), two Vinaceous Doves (*Turtur vinaceus*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE SPECTRUM OF MARS.—In connection with the recent discussion as to the presence or absence of the bands of water vapour in the spectrum of Mars, Dr. Janssen has published further particulars of the observations made by him in 1867 (*Comptes rendus*, July 29). He points out that even with the quantity of vapour in our own atmosphere, the bands would be all but invisible to an observer on Mars if the solar light were reflected normally from the earth's surface, and since the general conditions of the planet point to its atmosphere being less important than our own, it is easy to understand that the detection of the bands is a very delicate observation. To reduce the absorptive effect of the terrestrial atmosphere, observations should be made at a high altitude, and the use of the lunar spectrum as a term of comparison is also important. As to the apparatus required, Dr. Janssen does not consider large telescopes indispensable, as even with them the telluric bands can only be observed in their totality. Previous to observing the spectrum of Mars, Dr. Janssen had been engaged in an extensive study of the spectrum of water vapour as exhibited by a tube 37 metres in length. The observations of Mars were made on May 12-15, 1867, from a station on Mount Etna at an altitude of nearly 3000 metres; at meridian passage the altitude of the planet was 72°, and at sunset, when the observations were commenced, it was still more than 60° above the horizon, while the moon was a little lower. The cold was excessive during the nights of observation, and the quantity of vapour contained in the atmosphere overlying the place of observation would not be able to give indications of the telluric groups near C and D, according to the experiments with the long tube. Under these highly favourable conditions, Dr. Janssen found feeble but certain indications of the groups at C and D, and he is confident that future researches will justify the conclusion at which he arrived.

APPARATUS TO ILLUSTRATE DOPPLER'S PRINCIPLE.—The movement of the lines in a spectrum due to the approach or recession of the source of light is now so thoroughly well known, and has become of such importance in astronomical questions, that a laboratory experiment to illustrate this fact will be of interest. The idea, which we owe to the Russian astronomer, A. Belopolsky, and which was published in the *Memorie della Società Degli Spettroscopisti Italiani*, is as follows:—We know that the wave length of light ray can be varied by reflecting the light into a movable reflector, the amount of variation depending on the velocity of the reflector and the angles of incidence and reflection. By allowing the light to fall as vertical as possible on to the reflector, the variation of the wave-length can be magnified at will by increasing the number of reflectors. Now the apparatus suggested consists of two cylinders with parallel axes capable of being rotated very rapidly in opposite directions. On the surfaces of each a large number of reflectors are fixed, which are so arranged that when a ray of light from a heliostat falls on the reflector of the first cylinder, then from this on to a reflector on the second cylinder, and so on backwards and forwards, and finally into the slit of a spectroscope.

By closing first half the slit and photographing the spectrum, and then, on the same plate, photographing again the spectrum, only this time using the other half of the slit, the movement of the lines will thereby be doubly recorded on the plate, the double displacement being due to the two directions of rotation of the cylinders during the first and second exposure respectively.

Whether this idea can be carried out practically is yet to be seen, for there are many difficulties connected with it, such as the great velocities of the cylinders, perfect rigidity, &c., which will be hard to overcome.

THE PRÆSEPE CLUSTER.[1]

THIS work belongs to a class of investigations whose number has been steadily increasing in the last few years. The discussion of the relative motion of stars in loosely aggregated groups is a study that may throw light on intricate questions connected with the structure of the cosmos; and in this point of view, the Pleiades group has been discussed by several astronomers since Bessel laid the foundation for such inquiries more than fifty years since. The cluster in Perseus, the stars about the nebula of Orion and some other groups have already engaged the attention of astronomers, but nothing more complete or more interesting has appeared than the present investigation due to Dr. Schur; and it will hold its own till lapse of time gives a more trustworthy hold upon the small mutual displacements which successive investigations may reveal, for greater accuracy of measurement can scarcely be expected.

The present work divides itself naturally into three sections. In the first is given the results of a thorough examination of the instrument and of the constants of reduction, together with the triangulation of the group undertaken by Dr. Schur. In the second part is presented the measurements of position angle and distance of the stars by Dr. Winnecke, made with the Bonn heliometer in 1857 and 1858; and in the third, the comparison of the results of the measurements made with the Bonn and Göttingen heliometers respectively.

The investigation of the errors that accompany heliometrical measurement and their elimination, however complete and satisfactory, will only be of interest to experts in the use of this delicate instrument; but as evidence of the accuracy finally attained, we may quote the resulting values of the scale, derived from the measurement of the distances between stars in different parts of the heavens, whose places were determined with great accuracy for the reduction of the heliometer observations made in the Transit of Venus expedition. The places of the "Victoria" stars have been taken from Dr. Gill's paper:—

	Dr. Schur's value.	Dr. Ambronn's value.
	″	″
Stars in Cygnus	40·01601	40·01915
,, Hydra	40·01506	40·01610
,, near Pole	40·01562	40·01678
"Victoria" stars	40·01750	40·01710

In a measurement of approximately 2°, the two observers would assign values different by only 0″·22, a degree of accuracy upon which they may be congratulated.

[1] "Astronomische Mittheilungen von der Königlichen Sternwarte zu Göttingen." Die Oerter der helleren Sterne der Præsepe. Von Dr. Wilhelm Schur. (Göttingen, 1895.)

Notwithstanding this apparent accuracy, there still remains an unexplained discrepancy between measures made with the heliometer and the distances deduced from meridian observations. Dr. Gill has called attention to this peculiarity, and has suggested an explanation which does not seem to be satisfactory to Dr. Schur, or to apply to the Göttingen instrument, where a distance of about 1000″ appears to be measured too small by approximately a quarter of a second. This difference disappears for distances of about 5000″, and reappears with an opposite sign for the greatest distances possible to measure with the Göttingen heliometer. Dr. Schur employs, and justifies the employment of an empirical correction of the form—

$$\text{Correction} = as + bs^2 + cs^3$$

where the unit of s is 1000 seconds. On the assumption that the correction disappears for $s = 5$, and is at a maximum for $s = 1{\cdot}3$, he derives the following values for the coefficients:—

$$\text{Correction} = 0''{\cdot}473\,(s - 0{\cdot}50s^2 + 0{\cdot}06s^3).$$

The investigation of the corrections to the readings of the position circle is made with quite as much care as that devoted to measures of distance, but the probable error of a distance measure is only half as great as that of a measure of angle. This result, confirmed as it is by similar discussions in the case of other heliometers, induces Dr. Schur to base his triangulation of the group on measures of distances, reserving the measures of position angle for the orientation of the entire group after the solution of the triangles. The observations began in February 1889, and are continued till March 1892, and embrace forty-five stars of the group. The combined measures give rise to 123 measured distances, and each of these is compared with the distance computed from Asaph Hall's catalogue of the stars of the Præsepe Group ("Washington Observations," 1869, Ap. iv.), giving rise to as many equations of condition. These are collected into an enormous normal equation of seventy-four unknowns. The solution of such an equation is sufficient to make the boldest arithmetician waver, and seek some approximate solution, but Dr. Schur preferred to adhere strictly to the method of elimination proposed by Gauss, and after weeks of labour brought his work to a successful conclusion. Such a labour so carried out in the University of Göttingen, is a not unfitting tribute to the memory of the great mathematician whose name is connected with that particular form of solution. With a similar disregard to the quantity of labour involved, and with all the accuracy attainable, Dr. Schur finally fixes the coordinates of the forty-five stars under consideration.

A melancholy interest is attached to the second part of the memoir in which the results of Winnecke's measures are given to the world. The introduction is the work of that distinguished astronomer, and it will be a matter of sincere regret to all that his state of health has not permitted him to continue to the end an investigation of so much value and thoroughness. That the task of completion and editing has fallen to Dr. Schur is fitting and appropriate, and must have been to him a labour of love. The principal difference in the methods of observation at Bonn (where Winnecke's observations were made) and Göttingen consists in the greater reliance placed by Winnecke on the measures of position angle, a confidence scarcely warranted by the probable error deduced from the observations, which Dr. Schur gives as follows:—

Probable error in distance of 2000″ ... = ± 0″·218
,, ,, in position angle (in a great circle) = ± 0″·379

The final result is to give a catalogue of the places of 45 stars for the epoch 1858, which are comparable with the catalogue of Dr. Schur for the epoch 1890·54. The comparison of these two catalogues and the discussion of the proper motion forms the third section of the work.

Dr. Schur first examines the relative accuracy of the two catalogues, and decides in favour of the more modern, in the proportion shown by the following:—

	Göttingen.	Bonn.
Probable error of distance (4000″)	± 0″·193 ...	± 0″·354
,, ,, position angle	± 0″·359 ...	± 0″·506

From considerations based on these and similar facts drawn from meridian observations, Dr. Schur concludes that a difference of 0″·27 in the place assigned to a star in the two catalogues can hardly be regarded as a proof of the existence of proper motion. The difference between the coordinates both in R.A. and Declination, though larger than this quantity, is everywhere small and negative. The proper motion of ten of the stars has also been