our foremost living astronomers. The headings to the chapters are: The System of Our Stars; The Distances, Sizes, and Motions of the Stars: New Stars, Variables, Clusters, and Nebulæ; Building the Universe. Our readers will be readily able to conclude what is discussed in these chapters, which are well illustrated with plates.

Having said so much in praise of the book, we must say a few words by way of criticism. There are, indeed, too many blemishes which could be easily removed. Perhaps the absence of the author, searching for a new site for an observatory for the measurement of solar radiation, prevented him giving the book some needed revision. Kepler's laws are no doubt of importance, but they should hardly be given twice in the first 13 pages besides being given in their proper place on p. 68. On p. 7 the motion of the equinox amongst the stars is described as eastward; on p. 16 the shape of the aberration ellipse of a star is attributed to the observer's instead of the star's latitude; on p. 18 the verification of gravitation in double stars is attributed to Savary (who, indeed, computed a double-star orbit in 1827); on p. 70 the distance of Mars from the Sun is given as 151·5 instead of 141·5 million miles, and in the note on that page the principle of the method used for the determination of the mass of the Moon might be simply explained. It is implied on p. 100 that movements of material on the Sun more seriously affect the determination of the Sun's period of rotation from sun-spots than from radial-velocity observations. The figure on p. 122 should be discarded; on pp. 142–143 only half of the cause of the inequality of apparent solar days is given; on p. 153 the use of the word solar in defining hour-angle is wrong; the words "at the Earth's distance" in the footnote of pp. 172–173 should be deleted. These mistakes are no doubt trivial, but they are rather trying to the scientific reader. We trust that they will soon be remedied, and that the book will fulfil the purpose for which it was intended, of presenting clearly and interestingly the general results arrived at by astronomers of all ages, and the principal results recently arrived at by astronomers through the application of physical methods (practical and theoretical) to the celestial bodies.

NOTES.

"Ether Drift."—Prof. Dayton C. Miller gave a lecture on Ether Drift Experiments at the Royal Institution on Wednesday, June 2. In this lecture he gave a complete historical account of the Michelson-Morley experiment. The original result announced by Michelson and Morley in 1887 was that not more than one-

quarter, probably not more than one-sixth, of the effect expected from the Earth's orbital motion was revealed. In the apparatus finally used the length of the arms was increased from 5 feet to 14 feet, and by the use of mirrors which sent the beam backwards and forwards several times along the arms, the effective path was about 220 feet or 150 million wave-lengths. As the second-order effect expected as a result of the Earth's orbital motion is about 1 part in 100 million, and as the observations can be made to $\frac{1}{10}$th or even $\frac{1}{100}$th of a wave-length, it is clear that the experiment should be able to detect easily the effect originally expected. The enormous number of observations which have been made was indicated by the fact that the final result depends on about 10,000 rotations of the apparatus. The observations were carried out at Cleveland and at Mount Wilson, at different seasons of the year, throughout the 24 hours of the day and with different materials for the support. When the observations were analysed to show the Earth's orbital motion, they always indicated only a small fraction of that expected from the Earth's orbital velocity. But the numerous observations, when discussed to show motion in any direction, showed a drift in a direction approximately towards $17\frac{1}{2}$h. of R.A. and $+65°$ of Declination—only 6° from the Pole of the Ecliptic. The velocity indicated was about 10 times that indicated for the Earth's orbital velocity—say, 300 km./sec.,—although the lecturer stated that it might be even larger. The maximum velocity actually observed was about 10 km./sec. No explanation of the observations was attempted, and it cannot be considered that they seriously challenge Einstein's theory, for they indicate only a small fraction at the Earth's orbital motion. The latter and the smaller motions due to the Earth's rotation are the only motions for which there is any variation which can be tested by experiment. The lecture was illustrated with many photographs of the apparatus, and with cinematograph films showing the site at Mount Wilson with the apparatus rotating (supported on a mercury float). The diffraction fringes from an interferometer were projected on a screen, and the effect of bringing a lighted match near the apparatus was beautifully shown.

Solar and Terrestrial Relationships.—The first report of the Commission appointed by the International Research Council to further the study of solar and terrestrial relationships has recently been published. Besides the statements and recommendations made by the Commission at meetings held in Brussels in July 1925, the report contains several memoranda contributed by members of the committee and by other investigators. There is also a most useful summary of the literature, from 1914 to 1924, dealing with the relations of solar and meteorological phenomena.

All workers in this field of research will welcome this publication with its clear demarcation between established facts and probable relationships which require further observational confirmation. It is very satisfactory to note (amongst many other items of interest) that work on the measurement of ultra-violet solar radiation—associated with the names of Fabry, Buisson, and Dobson—is being undertaken at Mt. Wilson. Already there is promise of significant results (*see* also E. Pettit's article in the February number of the *Publications of the Astronomical Society of the Pacific*) which may give yet another index with which to express the Sun's irregular and periodic activity. The bibliography of literature dealing with solar and meteorological phenomena includes numerous researches and a variety of results and conclusions, the respective merits of which are difficult to gauge at a first perusal. Dr. Simpson's short but authoritative "Memorandum on the Study of Solar Radiation and Meteorology" on page 58 of the Report is therefore the more welcome. The following conclusions will probably be generally accepted: "Speaking broadly, one must say that the results up to the present have been disappointing. Clear and definite relationships have not been found between sun-spots and weather similar to those which have been found in the case of terrestrial magnetism. The eleven-year period is certainly recognizable in some meteorological factors, but in very few cases is the amplitude of any practical importance. The investigations into the day-to-day variations of solar radiation have been little more successful, although Mr. Clayton has exhibited many interesting and suggestive curves"; and later, "All these problems require investigation, but nothing can be done without absolutely reliable information about the solar radiation. There are plenty of meteorological data for most problems; it is the solar data which are lacking." Dr. Abbot's recent search in Africa and Baluchistan for suitable sites and his selection of a station in Africa show that he is prepared to carry on still further the determination with all possible accuracy of the amount of solar radiation—a subject to which he has devoted a large part of his life's work.

Meteor Notes.—*Large Meteors.* April 20, $21^h\ 12^m$ G.M.T. Large meteor seen in sunset glow at Cookstown, Co. Tyrone. Fell in West; path about 4°. Left streak for several minutes. —W. H. Milligan.

May 2, $23^h\ 3^m$. Fireball $\frac{1}{2}°$ in diameter. Gave a very brilliant flash; descended slowly in the west in an oblique path to N.W., altitude 25° to 10°; lit up the country and sky with a brilliant glare for several seconds. Seen at Cookstown and other places in N.W. Ireland, but the accounts are indefinite.

May 8, $21^h\ 10^m$. Meteor < 1st mag. Shot to just below Regulus. W. to E., descending slightly. Very slow. Fowey.

May 12, $22^h\ 55^m$. Fireball = ♀. Path $281° + 31\frac{2}{3}°$ to $273\frac{1}{2}° + 49°$; duration 1 second. Radiant probably $302° - 10°$. Seen at Ashby, Lincs, by A. King.

May 16, $21^h\ 0^m$. Bright meteor. End of path at Saturn; fell almost vertically inclined to the right. $\frac{1}{2}$ sec. > ♀. Seen at Beckenham, Kent, by R. L. Best.

May 21, 21^h to 22^h. A shower of 20 or 30 pretty bright meteors. Seen by Mr. Sims, of Lostwithiel, Cornwall. Chiefly seen in N. moving to west; various colours—green, blue, &c.

June 4, 22^h. Large and beautiful meteor fell through 30° from S.E. to N.W. Lost behind a low cloud-belt near horizon. Began in alt. 40°. Seen by C. W. Osman, Highfield, Chagford, Exeter.

These observations, some of which are very imperfect, are mentioned in the hope that other records may possibly be sent in. Many fine meteors do not receive sufficient investigation, from the fact that, though observed, they are not reported.

The meteoric shower which apparently occurred on May 28, in the early evening at Cornwall, will, it is hoped, be more fully described by others who witnessed it. The sky was cloudy at Bristol and possibly at many other places. This may partly account for the lack of suitable observations. There is a strong May shower from Hercules (radiant about $248° + 29°$) which I have sometimes seen in rather notable activity towards the end of the month, and the meteors recently seen would have conformed with the rough directions given by the Lostwithiel observer, but his description is unfortunately wanting in many necessary details.

The great Perseid shower is now in obvious activity, and further evidence as to its earlier and later stages are desirable. The period of the shower's display probably extends over ten weeks. The duration is already well established from the first week in July to the last week in August, and there is distinct, though perhaps not ample, evidence to show that this period must be extended. Bredichin thought that the beginning did not go back to July and the end not beyond Aug. 19. The American Meteoric Society confirmed my period from July 28 to Aug. 18, and I cannot explain how it is that the much longer duration has not been corroborated some time ago. When greater keenness and accuracy of observation have been attained the fact will become obvious, and the observers may perhaps wonder why it had not been seen before.

The *avant-coureurs* of this fine summer shower come soon after Midsummer Day, on June 25, while the last shots forming the rearguard are displayed on about September 6.

There is evidence that the well-known shower of α Capricornids ($303° - 10°$, July 19 to August 10) may be unusually strong this year as in 1916. W. F. Denning.

COMET NOTES.—Two new orbits of Comet 1925 *k* Peltier-Wilk have been published as follows; both are for 1925·0 :—

T (1925)	Dec. 7·31214 U.T.	Dec. 7·289 U.T.
ω	126° 2′ 37″	126° 7′ 54″
Ω	140 34 15	140 42 12
i	144 42 1	144 36 48
log q	9·882582	9·882678
Limiting dates	Nov. 25 to Dec. 7.	Not stated.
Computers ..	R. A. Rossiter, S. W. Taylor.	—. Ishii.
Reference ..	*A. J.* 860.	*Ast. Herald*, xix. 3.

The comet was followed till Dec. 31 by Prof. G. van Biesbroeck, when it was very low in the western sky. This was probably the last observation made anywhere.

Continuation of search ephemerides of Finlay's Comet for 0^h (from *B. A. A. Handbook*) :—

Assumed T.	June 19·0.				June 27·0.			
	R.A.	N. Decl.	log r.	log Δ.	R.A.	N. Decl.	log r.	log Δ.
	h m	° ′			h m	° ′		
July 13.....	4 38·3	21 39	·0294	·2181	4 21·2	20 38	·0166	·1818
21.....	5 9·8	22 48	·0458	·2299	4 53·9	22 5	·0294	·1942
29.....	5 39·7	23 32	·0650	·2413	5 25·1	23 3	·0458	·2064
Aug. 6	6 7·8	23 54	·0858	·2519	5 54·5	23 37	·0650	·2180
14.....	6 34·0	23 58	·1075	·2614	6 21·9	23 51	·0858	·2285

The comet will be low down in the morning sky. There should be a fair chance of observing it in August, when the Moon is absent.

A. C. D. C.

SOLAR ACTIVITY, JUNE 1926.—Disturbances have been well maintained throughout the month, six in the north (two being naked-eye groups) and eight in the south. Until June 3 the chief activity was south, represented by three well-developed groups at lat. −9°, −17°, −21°. From June 3 to 15 the northern activity was renewed in a large double group in low latitude +9°, and a single disturbance at +18°. From June 16 to 28 most of the disturbance consisted of a large naked-eye group at +25°, which exhibited great changes during its passage. Although during these two weeks the southern spots were very small, there was a large area of active bright calcium flocculi crossing the disc in lat. −20° to −30°. On Juue 24 and 25 two further large groups came over the north-east limb, developing into a long disturbed area (lat. +20° to +23°), which was visible to the eye on June 28.

Only few observations of prominences have been possible, so that the record is not complete. On June 7 arched structures

were present at lat. −59° to −64° S.E. and +41° to +46° N.W. On June 9 a large conical mass at +66° N.E. On June 18 a large winged prominence at +35° N.W. On June 20 massive structures at +43° to +48° N.E. +73° N.W., and small prominences at −27°, −63° S.W. C. P. B.

Obituary.—*William Carpenter Nash.* The death of William Carpenter Nash, a former member of the staff of the Royal Observatory, that happened recently severs the last link with the early years of Airy's administration. He was the son of a townsman of Greenwich, born on 1841 October 12, and began his career at the Observatory in the year 1856 as a computer in the Magnetic and Meteorological Department, then under the superintendence of Mr. James Glaisher. On 1864 January 1 Nash received the distinctive title of Magnetic Assistant, and for many years the magnetic instruments were in his charge, and the absolute values of the elements—Dip and Horizontal Force—were made by him with great skill and care. Mr. Glaisher was succeeded by Mr. William Ellis at the end of the year 1874, and on the retirement of the latter, on 1893 December 31, Nash became Superintendent of the department. He had been attacked by a complaint of a rheumatic nature about the year 1888, which crippled him rather severely; but, in spite of this infirmity, he performed the duties of his office until the end of the year 1903, when he retired in accordance with the regulations of the service as to age-limit. During his retirement he contributed to the publication *British Rainfall* "One Hundred Years' Greenwich Rainfall" (1915) and "The Diminution of Rainfall with Elevation" (1917). Articles of a similar nature and occasional weather notes from his pen will be found in former volumes of this magazine. In his early years at the Observatory he helped Mr. Glaisher in many of his researches, and accompanied that gentlemen in some of the balloon ascents undertaken for study of the upper air.

Mr. Nash died on March 5 last at the age of 84, having been quite incapacitated by his infirmity for some years. He leaves a widow, two sons, and two daughters.

From an Oxford Note-Book.

In an interesting paper (*C. R.*, May 31) M. Deslandres draws attention to the fact that magnetic storms tend to recur in a period R/6, where R = 27·275 days, the mean rotation period of the Sun. He gives 47 cases, with the longitude of the Sun's centre for each, and makes his point by exhibiting them in a large

table. But another way of representing them is to collect them in 12 groups of 5° of solar longitude, repeating after every 60°. The totals for the groups are found to be

4 3 4 0 5 5 8 1 3 2 5 7·

These suggest a division of the whole 360° into twelve parts rather than six. Adding together the 1st & 7th, 2nd & 8th, etc., we get

12 4 7 2 10 12,

which shows a well-marked maximum near the ends. The period R/12 is, indeed, mentioned by M. Deslandres, and it is not clear why he prefers R/6: possibly the latter attracted his attention at first and he has naturally retained it. The observations tabulated apply to epochs so far apart as 1882 and 1925, suggesting that the period R is a definite and accurate one, which is at first difficult to reconcile with our impressions of the rotation as being conducted in a variety of periods. But the same fact was encountered by Professor Schuster 20 years ago (*M. N.* lxv. p. 190). He found that the harmonics of this period, starting with the second, had large coefficients, though unfortunately he did not test the sixth and twelfth so as to find the results now put forward. M. Deslandres promises another paper on the subject, which we await with interest, especially since our views of the nature of the Sun's rotation have been recently subjected to drastic revision. Is R/12 the period of rotation of some inner core? By a curious coincidence a division of the Earth's surface into twelve lunes was recently suggested as an outcome of the study of earthquake periodicity (*Geop. Supp. to Mon. Not.* i. p. 244).

THERE is such a keen pleasure in learning the explanation of an already familiar fact that it is worth the risk of irritating those who know it already to take the chance of pleasing those who, like myself, have hitherto missed hearing it. The familiar fact is that we develop our plates by red light: the explanation is as follows:—

The simplest illustration of this equation ($E_1 - E_2 = \pm h\nu$) is provided by Einstein's photochemical law: "In a photochemical reaction the number of molecules which are affected is equal to the number of quanta of light which are absorbed." As a corollary to this law, the work done by one powerful quantum cannot be done by two weak quanta, or indeed by any number of weak quanta. If a quantum of a certain specified energy is needed to affect a molecule, quanta of lower energy, no matter how great their number, will produce no effect at all. The law not only prohibits the killing of two birds with one stone, but also the killing of one bird with two stones. Since the energy of a quantum $h\nu$ is proportional to its frequency ν we understand how a small amount of violet light can accomplish what no amount of red light would suffice to do: a fact familiar to every photographer—we can admit quite a lot of light if only it is red, but the smallest amount of violet light spoils our plates.

The quotation is from Dr. Jeans's Rouse Ball Lecture delivered at Cambridge on May 11, 1925, printed by the Cambridge Press under the title 'Atomicity and Quanta.' There is a good deal else worth attention in this small book of 64 pages—price not mentioned, but probably not large.

From an article on "Local Legislation" in the journal *The Local Government Service* for October 1925:—

Many large cities have a galaxy of Local Acts; much like the tail of a comet.

In the early years of the Royal Astronomical Society some of the prominent Fellows were Arctic explorers, such as Franklin and Parry. During the intervening century this pleasant association of exploration with astronomy has gradually been relaxed: astronomers no doubt feel the same interest as the world at large in Polar journeys, but perhaps not much more. All of us, however, must have felt a thrill on reading that Lieut.-Commander Richard Byrd of the U.S. Navy returned on May 9 after a flight of $15\frac{1}{2}$ hours "with the snow of the North Pole on the wings of his aeroplane"; and we must also have rejoiced, with the President of the United States, that the "flight seems to have been accomplished without mishap."

The mention of the present President U.S. reminds me of a cutting about a former President kindly sent me recently. It is from Jesse R. Grant's 'In the Days of my Father,' but no page reference is given:—

Ulysses S. Grant as an Astronomer.

Thereafter the roof of the White House was my goal on every clear night, and every other available hour was devoted to the microscope or camera. For a long time there were few more faithful star-gazers than myself. Night after night my father accompanied me to the roof, and there we studied over astronomical charts and tables, under the dim light of a lantern, and searched the heavens.

The accounts of the exploit of Commander Byrd were brief and gave no indication of the evidence that he had reached the Pole. Indeed, commentators were not slow to point out this deficiency. But an expert had already considered the possible methods for another explorer in the *Daily Chronicle* of April 20, and this is his very valuable report. It must be confessed that the last sentence introduces us to a method which we have all shamefully overlooked:—

Amundsen will locate the Pole by astronomical observations, but if he forgets to take a theodolite or sextant with him other methods are possible.

Owing to the fact that the Pole is nearer the centre of the Earth than any other place, gravity is at its maximum there, and a weight of exactly a pound at the Equator would weigh 1·0035 lb. at the Pole, and, with a good spring balance, which can be made to show a difference of one part in 10,000, the extra weight of a pound could easily be determined. With a chronometer, too, and a pendulum made to beat once in a second, the Pole might be located; it would have to be one-fifth of an inch shorter at the Pole than at the Equator. Or if Amundsen found the wind always south, he would know he was at the Pole, for there is no north, east, or west at the N. Pole.

We owe much to the foreigner who boldly essays to write our language, though possibly we in our diffidence do not give him the same opportunities of enjoyment. Without shame I admit being much exhilarated at being addressed recently as "such a prestigious scientific man," though at first bewilderment masked the pleasure: it had not occurred to me how the word "prestige" could be amplified into an adjective.

Astronomy owes much to Trinity College, Cambridge, and the wise munificence of the late Frank McClean has secured that the debt will continue to accumulate in the future. No further excuse is therefore needed for a reference to the recently published Life and Letters of Henry Jackson, O.M., who for a lifetime represented all that was best in Trinity. In support of which rather sweeping statement let me recall that when the present Master was inducted (by Henry Jackson as Vice-Master) he said a very graceful and true thing. He referred to the game invented by experimental psychologists; they mention suddenly some thing or idea with the understanding that the hearer is immediately to mention the first thing or idea suggested by it: and he averred that if to any old member of the College the idea of "Trinity" should in this way be presented, he would without hesitation respond "Jackson." Hence I will venture without further preamble to lift a couple of stories from the letters. The first is from one to Sir G. O. Trevelyan on 19 March, 1916. After some remarks on the faulty grammar of Thucydides, he adds

> Do you know the old Cambridge parody [of Thucydides] which I have always attributed to Augustus Vansittart? "Awkward animals to drive is a pig, one man many of them very."

The next is about a well-known habitué of Switzerland who had in earlier days done a good deal of climbing, but—

> H——y of Sidney once said to a Cambridge lady that he was too old for Alpine work, of which he had been bragging. She said, "In fact you are now in your *table dotage*." The same lady said of H——y that "When he had been in Switzerland, the flies suffered from D.T." You will say that I am in my anecdotage and you will be right.—*Life*, p. [164].

It has been an incidental aim in these notes to encourage an interest in literature alongside that in science: therefore it was with distinct pleasure that I was introduced, and am able to introduce the readers of this magazine, to a new form of poetry. I believe the following poem is called a woogle-norm, but I don't know why :—

Stan Ebbing was a glazier
A worthless artisan
You could not find a lazier
Or less enlightened man.
He meant to wed Aspasia,
The daughter of a Yid,
But, stricken with aphasia,
He fell into his brazier,
And died in euthanasia;
'Twas just as well he did.

Some of the rules are patent. Thus, if anyone is stimulated to apply this graceful method more directly to our Science, I imagine that as a rhyme to astronomy, "honour me" would count higher than "economy" or "gastronomy"—at any rate, these latter should not appear until some variant has distracted the attention of the hearer. Use might also be made of "bonhomie," and ingenuity may supply others. Perhaps we may thus find a refuge from cross-word puzzles. My friend has been good enough to supply me with a store of 9 examples, so that another may be spared as bait :—

Chapita is a matador,
Who slaughters bulls in Spain,
And maidens lean and fat adore
The way those bulls are slain.
His silken cloak is spattered o'er
With spangles bright and gay,
And whether he is flattered or
Caressed or coaxed the matador
Is never gored or battered or
Perturbed in any way.

Madison, Wisconsin.
May 7, 1926.

Dear Mr. Oxford Note-Book,—

Concerning your difficulties with American geography (page 134, April number *Observatory*), the time was when every American school-boy learned that the Mississippi River rises in Lake Itaska, Minnesota, and flows into the Gulf of Mexico. The Mississippi Valley is that area drained by this river, and is some fifteen hundred miles long and about of the same width. This great river does not run backwards, but it does flow uphill, as the mouth is several miles farther from the center of the Earth than is the source.

There are some thirty cities and towns in the United States which go by the name of Washington; also about an equal number of Lincolns.

All this to show that we read and appreciate the Oxford Note-Book.

Very sincerely,
J. S.