basis, they give the following melting points:—silicon, 1452° C.; palladium, 1576° C.; rhodium, 1968° C.; indium, 2388° C.; the temperature of the glower at normal brilliancy 2480° C., the melting point of the glower material 2490° C.

THE atomic weight of radium was determined five years ago by Mme. Curie on about 0·09 gram of a highly purified radium chloride. Large quantities of Joachimsthal pitchblende residues have since then been worked up, and from these 0·4 gram of pure radium chloride has been obtained. The method of purification adopted was recrystallisation from weak hydrochloric acid and fractional precipitation of the aqueous solution by alcohol, the progress of the purification from barium being followed by means of the spectroscope. It seemed desirable to repeat the determination of the atomic weight on the larger quantity now available, and Mme. Curie gives an account of the method adopted in the current number of the *Comptes rendus* (No. 8, August 19). Difficulties were encountered owing to the presence of traces of impurities in the reagents, leading to a gradual loss of radium during the purification, and a detailed account is given of the elaborate precautions found to be necessary for the preparation and preservation of the reagents used. The atomic weight deduced from the ratio radium chloride: silver chloride is 226·2 (Ag=107·8, Cl=35·4), or 1·2 units higher than the value found on 0·09 gram in 1902. It is shown that the slight increase of purity of the 1907 over the 1902 preparation is not sufficient to account for the rise of 1·2 units in the atomic weight, the difference being most probably due to the loss of accuracy on the determinations with the smaller quantity and the use of reagents not properly purified.

THE August number of the Journal of the Institution of Electrical Engineers (No. 185, vol. xxxix.) contains, amongst others, a paper on the technical training of electrical artisans, read by Mr. C. P. C. Cummings before the Dublin local section of the institution. The subject is one which is very rarely treated in papers read before the Institution of Electrical Engineers or the branch sections, but, at the same time, it is one which is very important to the future development of electrical work. The term electrical artisan, as referred to by Mr. Cummings in his paper, deals almost entirely with those electrical artisans who are generally classified as "wiremen," and the paper treats of the possibilities of improving the existing methods by which such men are trained at the present day, so that more efficient workmen may be obtainable. Mr. Cummings very rightly points out that there is a very large majority of the "so-called wiremen" obtaining the maximum rate of wages per hour, which the highly trained and competent workman is fully entitled to, who cannot be placed in the same class with him, and can obtain this rate without any trouble. This in itself is evidence of the serious defect in the method by which electrical artisans are produced. So long as these methods continue, they will produce a considerable number of men who cannot be considered fully competent, but very few first-class artisans, and from this very fact the really competent men consider themselves so strong by virtue of their minority that their demands upon employers and their general independence greatly reduce their utility. Mr. Cummings describes the present method of training electrical artisans, and points out the faults of the system and propounds a scheme which is well worth the consideration of educational authorities and employers—especially the latter—for until the employers take a practical interest in this matter they cannot hope to obtain the man most suited to their requirements.

MESSRS. JOHN J. GRIFFIN AND SONS, LTD., of Kingsway, have just issued a new edition of "Chemical Handicraft," giving particulars (in many cases illustrated) of the chemical apparatus and reagents manufactured and sold by them. Science teachers will find the volume very handy for reference.

THE lectures delivered under the Silliman foundation at Yale University in March, 1905, by Prof. E. Rutherford, F.R.S., which were afterwards issued in book form under the title of "Radio-active Transformations," have now been translated into German by Dr. Max Levin, of Göttingen, and published by F. Vieweg and Son, Brunswick. Brief reference is made in the volume, in the form of footnotes, to the more important advances in the subject which have taken place since the first appearance of the work in English.

OUR ASTRONOMICAL COLUMN.

DANIEL'S COMET, 1907*d*.—The following is a continuation of the ephemeris for comet 1907*d* given in No. 4196 of the *Astronomische Nachrichten* (p. 237, August 23):—

Ephemeris 12h (M.T. Berlin).

1907	α (true) h. m.	δ (true)	log *r*	log Δ	Brightness.
Sept. 9 ...	9 47·5 ...	+ 11 5·7 ...	9·7250 ...	0·1139 ...	13·7
,, 11 ...	9 57·3 ...	+ 10 26·0			
,, 13 ...	10 4·7 ...	+ 9 45·9 ...	9·7495 ...	0·1408 ...	10·8
,, 15 ...	10 15·7 ...	+ 9 5·5			
,, 17 ...	10 26·3 ...	+ 8 25·1 ...	9·7818 ...	0·1654 ...	8·3
,, 19 ...	10 36·5 ...	+ 7 44·9			

It will be noticed that the brightness of this object is declining rapidly, and, as the comet rises nearer and nearer to sunrise, it is becoming increasingly difficult to observe. At present it rises about two hours before the sun, and on September 19 it will precede the sun by about 1½ hours, rising about 12° north of east.

Comptes rendus, No. 8 (August 19), contains the results of observations made by M. E. Esclangon at Bordeaux. The head of the comet was extraordinarily bright and of about 5′ diameter on August 1. Seven tails were seen, the extreme streamers being much shorter than the median. A reproduction of the observer's drawing shows the disposition of the tails.

SOLAR OBSERVATIONS AT CARTUJA, GRANADA.—In an extract from No. 3 (1907) of the *Bulletin de la Société belge d'Astronomie*, M. J. Mier y Terán, S.J., publishes an account of the solar observations and reductions now carried on at the Observatory of Cartuja-Granada (Spain).

Solar observations were commenced at the beginning of 1905 for obtaining statistics relating to sun-spots and faculæ. In January 1906, photography was substituted for eye observations for the purpose of obtaining more precise measures, and photographs have since been secured on each clear day. A more suitable photoheliograph has recently been erected having an objective of 94 mm. (3·7 inches) aperture and 1·50 m. focal length, and fitted with a direct enlarger giving a solar image of about 10 cm. (4 inches) diameter. The areas and positions of the spots, &c., are measured with a Hilger micrometer, the positions afterwards being reduced to heliocentric coordinates in the usual manner, and it is hoped that the results will be found sufficiently precise to supplement the Greenwich measures. As it is proposed to publish these results in the tri-monthly numbers of the observatory bulletin, it may be expected that solar workers will find them available without having to wait for the Greenwich annual publications. Spectroscopic observations of the sun and the stars are also being carried on at Cartuja, and it is hoped that ere long the apparatus for spectrophotography with a large dispersion will be installed.

DISCOVERY OF SEVENTY-ONE NEW VARIABLE STARS.—The wholesale discovery of new variable stars from photographic plates is proceeding at Harvard, and in Harvard College Observatory Circular, No. 130, Prof. Pickering announces the discovery of a further batch of seventy-one new variables. These were found by Miss Leavitt on the Harvard maps Nos. 9, 12, 21, 48, and 51. Prof. Pickering gives a table showing the proportion of newly discovered variables to the total number now known to exist in each region examined, and arrives at the general deduction that about one-third of all the variables in the three northern regions examined, and about one-half of those in the two southern regions, yet remain to be found. The designations, positions, and magnitude ranges of the newly discovered variables are given, and the list includes thirteen probable Algol and seven long-period variables, the proportion of the former being remarkable, as in the case of Region 50 discussed in Circular No. 122.

THE ELECTRICAL ACTION OF THE SUN.—In these columns for March 14 we referred to a discussion, by Dr. Albert Nodon, of the nature and effects of the sun's electrical charge. The whole discussion is now published as an extract from the *Revue des Questions scientifiques* for April and July, and will be found to be of great interest by all workers on solar physics and the allied terrestrial phenomena. In the first part of the paper Dr. Nodon discusses the observations, the apparatus used in making them, and the theories deduced from them. The second part contains a discussion of the application of the results to the explanation of cometary, planetary, and terrestrial phenomena, whilst in the third part of the paper the author discusses the deductions relative to terrestrial physics. The paper is published by J. Polleunis, 45 rue Sans Souci, Brussels.

MICROMETER MEASURES OF DOUBLE STARS.—In No. 4193 of the *Astronomische Nachrichten* (p. 277, July 26) Dr. H. E. Lau publishes a further list of Struve double stars measured by himself, and discusses the mean probable errors of his measurements. In addition to the eighty measures made by Dr. Lau, the list also contains twenty-eight measures made by Herr Luplau-Jannsen.

THE MAY OR GORSEDD YEAR IN ENGLISH AND WELSH FAIRS.

SIR NORMAN LOCKYER has taught us to call the year indicated by alignments of stone monuments in Britain the May year. The quarter days of that year are astronomical, being the half-way stations of the sun between the solstices and equinoxes. In fixing these dates, of course the solar quarter days were marked as well, which year is conveniently called the solstitial year. It will clear the way for the discussion of some figures bearing on the subject if the two series of quarter days are presented here side by side, as given in "Stonehenge Astronomically Considered," p. 23 :—

MAY YEAR ...	Feb. 4	May 6	Aug. 8	Nov. 8
SOLSTITIAL YEAR ...	March 21	June 21	Sept. 23	Dec. 23

The quarter in both series is of the same length, ninety-one days, and the distance from a solstitial quarter day to a May-year one is roughly forty-five days.

Though the name May year is a very happy one, as the May festival was certainly the most popular, it is really the Gorsedd year, the very *raison d'être* for that institution which, in form, purpose, and ritual, is the temple-observatory brought up to date. We know now for what purpose the megalithic monuments were raised, and that knowledge has been acquired by working from the known to the unknown. By assuming that the Welsh Gorsedd is a much truer representation of ancient Druidism than the manifestly inaccurate, second-hand observations of Cæsar and other classical writers, we are able to see at the Welsh National Eisteddfod in this twentieth century the actual use to which the temple-observatory was put. If such a broad assertion causes surprise, that surprise is considerably lessened by what seems to me to be an incontrovertible fact, that, instead of having one Gorsedd, and that in Wales, a true survival from late Neolithic times (to fix an indubitable downward limit), we have in Britain more than one thousand Gorsedds the pedigrees of which are as unimpeachable as that of the Welsh institution. I refer to fairs still held on the quarter days of the May year. To a student of the Welsh Gorsedd this fact at once dispels any *a priori* doubt as to the antiquity of that institution. It is only one among a thousand, though, I would maintain, it is the only one that shows what all the others were at first.

The Gorsedd and the popular fair are one and the same, constituting a true monument as ancient as a temple-observatory in stone. A better way of putting it is, the temple-observatory has survived in (1) stone, in (2) tradition, and in (3) festival. The Welsh Gorsedd presents this triple evidence.

There is, I think, no need for a formal proof of the prevalence of the May year in Ireland, Scotland, and Wales, or the "Celtic fringes." It reigns supreme over still purely Celtic ground. It is when one comes to England proper that even one accustomed to mark time in May-year terms must confess to a feeling of surprise. The evidence from the Celtic fringes is, of course, indispensable to understand and explain the English May-year fairs, but a brief presentation of the English case may be helpful by way of enlisting the cooperation of English archæologists to make that case as strong as possible.

I take Owen's "New Book of Fairs" for 1824 as source. The book was published by Royal licence, but as regards Wales it is incomplete, and I would infer as much as regards England. The following figures, except those given by counties, include the Welsh fairs as given in the list. That inclusion cannot affect seriously the English case, as will be seen.

The relative popularity of the May and of the solstitial years may first be ascertained by comparing the number of all fairs in May with those in June. May fairs, 510; June fairs, 250; 2 to 1 for May.

There are two lists of fairs in Owen's book, one by counties and the other by dates. I take the latter first. The figures in every case are my own. As the book is incomplete, and all lists of fairs I have consulted are so, I have thought it sufficient for the present purpose to make only one rapid reckoning of the fairs. The chief fair days can be easily noted by large groups of fairs. The fairs corresponding to the May-year festivals are to be looked for under several dates. The astronomical day is in many cases observed eleven and twelve days later. Generally, that day has given way to the first of the calendar month. In both cases new and old style dates must be noted. Then there are fairs depending on such dates. All fairs held during the first twelve days of the month should be numbered. In the case of November, the inclusion of Martinmas fairs needs no comment, as November 11 is a Scottish quarter day, and the Scottish quarter days, with the fact that in Gaelic-speaking Scotland the months, as well as the seasons, are still reckoned in the true May-year order, is sufficient formal proof of the predominance of that year on Celtic ground.

February	Fairs	May	Fairs	August	Fairs	November	Fair
2 ...	8	1 ...	32	1 ...	18	1 ...	10
5 ...	7	4 ...	42	2 ...	29	6 ...	13
13 ...	20	6 ...	38	5 ...	53	8 ...	43
14 ...	12	8 ...	14	10 ...	16	11 ...	17
D. ...	21	12 ...	81	12 ...	26	12 ...	26
—		13 ...	11	15 ...	13	13 ...	14
—		14 ...	42	D. ...	50	17 ...	18
—		17 ...	16	—		22 ...	43
—		18 ...	12	—		D. ...	57
—		D. ...	71	—		—	
	68		359		205		241

D. = Dependent fairs.

Thus we have 873 plain May-year fairs. I claim now the Church-year fairs, which are plainly the old May-year festivals. For February 4 I claim 28 fairs between Candlemas and the beginning of Lent; for May 6, 358 Whitsun and Ascension fairs; and for November 8, 53 fairs at Michaelmas, 71 on October 10 (Old Michaelmas), and 32 on December 11 (Old St. Andrew's Day). Though Michaelmas and St. Andrew's Day are both a month away from November 1, they constantly occur as half-year