

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 in 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 in 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 archaeologists 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

days corresponding to May Day. It is very likely, however, that some of the August fairs have been absorbed into Michaelmas. As that day occurs so near to the autumnal equinox, some concession must be made also to the solstitial year. There is no need, however, to decide these points at present.

We can now add 542 to our list of May-year fairs, altogether 1415 fairs which may reasonably be claimed as so many Gorsedds or prehistoric monuments, 96 in February, 717 in May, 205 in August, and 397 in November. It is curious to note that the number of plain May fairs and of Church-year May fairs is the same. The ratio for November seems to be too high, and the number for that month has grown evidently at the expense of August. Dividing the total for August and May, we get 301 for each of those months to match the figure for May, which is always at least twice as high as the corresponding figures. For obvious reasons February is a poor time for fairs, and the intrusion of Lent has very generally broken up that end of the May year. A more thorough scrutiny will be the means of recovering many February 4 fairs.

If the above estimate is considered too generous, my estimate of the solstitial-year fairs must err more in that pleasing direction, for I include, against strong reasons, all the Easter fairs in that estimate.

Fairs		Fairs	
March 21	2	June 22	29
April 5... ..	37	" 24	35
	39	July 5	54
			118
Easter	231	Trinity	59
	270		177
Fairs		Fairs	
Sept. 19	31	December 21	7
" 21	20	" 25	8
Oct. 2	53		
	104		15

There are, then, 276 true solstitial fairs and 347 Church-year fairs to bring the total up to 623; but the figure for Easter shows evident borrowing from February, the vernal equinox, and May. A fair ratio would be obtained by counting sixty Easter fairs for the vernal equinox and the remainder for February.

In claiming the Easter fairs for the May year, I have a larger number of fairs to add to the solstitial estimate. Beside the May year, with the portions of the Church year which are evidently based on it, and the solstitial year as such, there are two other series of dates to consider. The one I would call the Roman year, being important dates in the old Roman year, which were early associated with the names of Christ, St. Mary, and at least six of the Apostles. I refer to groups of fairs on the 25th of the month. There are 25 fairs on March 25 and 43 on September 25, 68 fairs which I would add to the solstitial estimate.

The other series of dates I would call the Petrine year, with groups of fairs on the 29th of the month. When the old Celtic saints of Llandaff Cathedral, Teilo and Dyvrig, May-year saints, were superseded in Anglo-Norman times by SS. Peter and Paul, June 29 was fixed as the beginning of the year in that cathedral. The canons there still mark their time of residence as from that date. The Petrine year is fairly general, though it is altogether subsequent to the middle of the twelfth century A.D., at any rate in South Wales. There are 18 fairs on March 29, 35 on June 29, 45 on July 10 (O.S.), 53 on September 29, and 71 on October 10 (O.S.), in all 251 fairs which I would add to the solstitial estimate, which now stands at 948 fairs.

The May year is still 467 ahead, and the May-year figures are certainly much more satisfactory than the large figures I have juggled for the solstitial estimate. If the latter is fairly correct, I must now add it in a lump

to that of the May year, and say that we have still in England and Wales 2363 fairs, relics of festivals held at the same spots or thereabouts when the dates were obtained by direct solar observations by means of aligned monuments. Several capable archæologists have expressed the opinion, aent the astronomical theory, that they admit the solstitial alignments, while doubting the very existence of the May year in connection with the monuments. Such admission is substantially complete. The solstices and equinoxes were of little direct practical use to the ancient farmer as dates to commence farming operations. The Welsh farmer of to-day is finely indifferent to the almanac statements that spring begins on March 21 and winter on December 23. He knows better. The solstitial quarter days were observed as points from which the infinitely more practically important May quarter days could be correctly marked.

So far I have made only a rough preliminary reconnaissance of the list of fairs. I now take up Owen's list of fairs by counties, not to learn more about the relative prevalence of the May and the solstitial year so much as to learn more concerning the May year itself. Except May 6 and November 8, I have counted all fairs in February, May, August, and November. From the Church year I have borrowed only some pre-Lenten fairs for February and the Whitsun fairs for May. The total is just the same, but the analysis is much more to the point. The Welsh fairs are included, though the list is very defective. The letters F.M.A.N., variously grouped, represent May-year quarters:—

	Feb.	May	Aug.	Nov.	May 6	Nov 8	Fu year	F. M.	F. M. A.	F. A.	M. A.	M. A. N.	M. N.	A. N.	F. A. N.	F. N.	F. M. N.
Bedford ...	3	8	3	7	1	2											
Berks ...	2	7	2	4	1	2											
Bucks ...	3	11	3	3	3	1											
Camb. ...		3	1														
Cheshire ...	1	9	5	7	2	1											
Cornwall ...	7	27	11	17	2	3											
Cumberland ...	1	7	5	2													
Derby ...	4	9	4	8	1	1	1	1									
Devon ...	8	25	15	11	2	1											
Dorset ...	6	11	7	5	1	1											
Durham ...		8	1	4	1												
Essex ...		30	10	8	2	1											
Glouc. ...	1	19	4	8	2	2											
Hants ...	4	21	2	7	2	2											
Hereford ...	5	12	4	6	1	1											
Herts ...		10	3	2		1											
Hunts ...	5	12	4	6													
Kent ...	5	40	20	7	3	2											
Lancashire ...	2	16	7	11	1												
Leicester ...	3	4	3	4													
Lincoln ...	1	16	11	9	2	2	1										
Middlesex ...		4		1	1												
Norfolk ...	3	24	11	13	1	2											
Northampton ...	6	11	5	3													
Northumberland ...		9	7	7		1											
Notts ...	1	6	2	3		1											
Oxford ...	1	7	7	5	1	1											
Rutland ...		1		1	1												
Salop ...	5	18	9	6	1												
Somerset ...	5	27	25	13	2	3											
Stafford ...	8	14	5	10	3												
Suffolk ...	2	16	12	4	1												
Surrey ...	1	16	5	6													
Sussex ...		51	12	12	2	2											
Warwick ...	4	9	4	4	1	2	3	1									
Westmorland ...		6	1	1		1											
Wilts ...	1	17	10	2	6												
Worcester ...	2	4	4	1													
Yorks ...	15	42	22	26	5	2											
	111	587	266	254	48	38	12	19	8	7	51	12	77	17	2	8	10

	Feb.	May	Aug.	Nov.	May 6	Nov. 8	Full year	F. M.	F. M. A.	F. A.	M. A.	M. A. N.	M. N.	A. N.	F. A. N.	F. N.	F. M. N.
Anglesey ...	3	2	3	5	1								1	3	1		
Brecknock...	—	5	2	3							1	1	2				
Cardigan ...	4	2	2	2			1										
Carm. ...	—	7	6	10	1	1							3	1			
Carn. ...	1	7	8	6		1			1				1	2			
Denbigh ...	2	12	9	9	2	1	1					3	4			1	
Flint ...	3	5	4	3			1				1				1		
Glam. ...	2	7	7	5	1		1				2	1	1				
Merion. ...	1	5	7	5								1	2				
Monmouth ...	—	6	4	3	1						1	2	1				
Montgomery	—	5	1	3							1	2	1				
Pembroke ...	—	5	1	5			1						1	1			1
Radnor ...	1	5	2	2	1								1				1
England and Wales ...	128	660	322	315	55	41	17	21	9	7	57	21	97	22	5	10	11

It is curious to note that the total of fairs in February, May, August, and November, with pre-Lenten and Whitsun fairs, is 1425, just ten less than the total of true May-year fairs plus all the Church-year fairs which I would claim for that year. I can, therefore, add the Michaelmas and St. Andrew fairs to the last total obtained and make it 1571, or a round fifteen hundred May-year fairs, nearly two-thirds of the total number of solar, as distinguished from mere calendar, fairs.

Wales makes but a very poor show in Owen's list. Instead of five complete May-year series, I have noted ten in North Wales alone; but it serves the present purpose to keep Wales in the background.

It is satisfactory to find seventeen complete series. The case of Weldon, Northamptonshire, is eloquently put as follows:—"First Thursday in February, May, August, and November." There are, however, ten other combinations of May-year quarter days, each of which tells the same tale, and there are 277 places where the May-year seasons are observed by fairs, that is, where more than one May-year fair is held. The relative prevalence of the eleven combinations may be shown as follows:—

	Feb.	May	Aug.	Nov.
17	1	1	1	1
10	1	—	—	1
21	1	1	—	—
9	1	1	1	—
7	1	—	1	—
57	—	1	1	—
21	—	1	—	1
97	—	1	1	1
5	1	—	1	1
22	—	—	1	1
11	1	1	—	1
277	7	7	7	7

Each May-year quarter day enters into seven combinations, which reminds me of the story invented, I believe, to account for the popular name of the parish from which I write, *Yr Hên Blwyw*, the Old Parish. The story goes that a stone-cutter carved the figure 7777 on a gravestone intended to commemorate a man whose age was twenty-eight. By the way, multiplying the May-year sevens together would be a good way to remember the number of solar fairs we have made out, 2303 for 2363, leaving a margin of sixty for possible errors in such a large estimate.

No combination of figures affects the supremacy of May Day. February enters into combination with other quarters at 80 places, May at 230, August at 139, and

November at 183. Generally, the ratio seems to be:—February=1, May=3, August=2, November=2.

But in the two most decisive factors there is not much to choose between May and November. These two factors are the prominence of the summer half of the May year and the fact that the astronomical dates are still observed at ninety-six places in remarkably even numbers—May, 55; November, 41. May 6 is associated with St. John the Evangelist. Such association may have helped to preserve the date; but no such Church sanction, favour, or support has been given to November 8. There are four places in England where both dates are still observed. In several instances where the astronomical dates have been preserved I note a startling parallelism between the dates and the prominence acquired by those places in tradition and archaeology.

List of Places where Fairs are held on May 6 and November 8.

Bedfordshire ...	Nov. 8 ...	Biggleswade.
Berkshire ...	Nov. 8 ...	Abingdon, Aldermaster.
Buckinghamshire	May 6 ...	Newbury.
		Buckingham, Ivinghoe, Risborough.
Cheshire ...	Nov. 8 ...	Buckingham.
	May 6 ...	Macclesfield, Frodsham.
	Nov. 8 ...	Knutsford (or Knotsford).
Cornwall ...	May 6 ...	Treganatha, West Looe.
Derbyshire ...	Nov. 8 ...	Helstone, Newlyn, Stratton.
	May 6 ...	Pleaseley.
	Nov. 8 ...	Ripley.
Devonshire ...	May 6 ...	Chawley, Tavistock.
	Nov. 8 ...	Hatherleigh.
Dorsetshire ...	May 6 ...	Stalbridge.
	Nov. 8 ...	Blandford.
Durham ...	May 6 ...	Walsingham.
Essex ...	May 6 ...	Dunmow, Halstead.
	Nov. 8 ...	Dunmow.
Gloucestershire	May 6 ...	Dursley, Winchcomb.
	Nov. 8 ...	Cirencester, Lydney.
Hampshire ...	May 6 ...	Liss, Southampton.
	Nov. 8 ...	Blackwater, Rumsey.
Herefordshire ...	May 6 ...	Wigmore.
	Nov. 8 ...	Leominster.
Hertfordshire ...	Nov. 8 ...	Hertford.
Kent ...	May 6 ...	Ashford, Groombridge.
	Nov. 8 ...	Biddenden, Chilham.
Lancashire ...	May 6 ...	Newton.
Lincolnshire ...	May 6 ...	Bourn, Holbeach.
	Nov. 8 ...	Alford, Stamford.
Middlesex ...	May 6 ...	Brentford.
Norfolk ...	May 6 ...	Rudham.
	Nov. 8 ...	Diss, Massingham.
Northumberland	Nov. 8 ...	Hexham.
Nottinghamshire	Nov. 8 ...	Bingham.
Oxfordshire ...	May 6 ...	Chipping Norton.
	Nov. 8 ...	" "
Rutland ...	Nov. 8 ...	Oakham.
Shropshire ...	May 6 ...	Wem.
Somersetshire ...	May 6 ...	Pensford, Stoke-Gomer.
	Nov. 8 ...	Dulverton, Pensford, Somerton.
Staffordshire ...	May 6 ...	Uttoxeter, Wednesbury, Longnor.
Suffolk ...	Nov. 8 ...	Newmarket.
Sussex ...	May 6 ...	Lewes, Bolney.
	Nov. 8 ...	Billinghurst, Forest Row.
Warwickshire ...	May 6 ...	Coleshill.
	Nov. 8 ...	Sutton, Warwick.
Westmorland ...	Nov. 8 ...	Kendal.
Wiltshire ...	May 6 ...	Amesbury, Colne, Maiden Bradley, Chippenham, Mere, Purten.
Yorkshire ...	May 6 ...	Hunmanby, Knaresborough, Pocklington, Askrig, Burton in Bishopdale.
	Nov. 8 ...	Leeds, Keighley.
Wales ...	May 6 ...	Langharne, Llannerchymedd, Nantglyn, Hay, Penrice, Knighton.
	Nov. 8 ...	Aberconway, Llanedi, Llanrhaiadr.

From other sources I find six more May 6 fairs in Wales and three November 8 fairs, in all twelve of the former and six of the latter. Only in one place, Llanfynydd, Carm., I find both days observed.

Pensford, where both dates are retained, is near Stanton Drew, where Sir Norman Lockyer has made out a May alignment. At Lydney, Gloucestershire, a Roman inscription has been found to the Celtic Neptune, *Nudd* or *Lludd*. At Hexham a similar inscription equates Apollo with the Celtic god Maponos. Dunmow's fitch of bacon should be carefully studied.

I think all will admit that the phrase "startling parallelism" is no exaggeration when the case of Wiltshire is considered. When Sir Norman Lockyer ascertained the age of Stonehenge from the alignment of the avenue, he found evidence there of an earlier May-year temple. Geoffrey of Monmouth fixes the earliest festival he mentions as having been held at Stonehenge on the Kalends of May. That must have been against his liking as an ecclesiastic, and the next festival, held shortly after the first, he fixes at Pentecost, the Church equivalent of the May festival; but Geoffrey never fixes a Church festival where and when such a festival was an historical impossibility. Therefore it is practically certain Stonehenge was a May temple pure and simple in the fifth century A.D.

Now Wiltshire heads the record with six fairs on May 6 and its equivalent May 17. So the astronomical, historical, and ferial evidences point clearly to the preeminence of Stonehenge as a May temple. No wonder the Welsh bards claim it as one of the three chief Gorseddus.

But what of the manifestly solstitial character of the present ruins at Stonehenge? In Wiltshire seventeen out of thirty May-year fairs are held in May, but the May year as such is nearly *non est*. May and August combine in one place; that is all. On the other hand, the solstitial year in the county is a fairly well-balanced year. There are five fairs held on the vernal equinox, five on the summer solstice, eleven on the autumnal equinox, and three on the winter solstice, the last figure being quite significant, as definite winter solstice fairs are very rare, though, of course, as Christmas, it has no rival.

Now, the local fairs connect the two series of facts in the most striking manner. "Amesbury, May 17, June 22." So does Owen solve the riddle of Stonehenge. Chippenham, May 17, June 22. Maiden Bradley, May 6, October 2 (O.S. for September 21). Mere, May 17, October 10 (O.S. for September 29, here very likely September 21 at first). Ignoring the date May 6, we have many other like combinations, February 14—October 2, May 14—September 25, July 10—August 1, May 14—October 10, May 12—October 2, May 20—September 23—December 23, May 7—October 8. At Laycock we have only the two solstices July 7—December 21.

Since the foregoing tables were compiled, I have discovered that the estimates for both the May and the solstitial years are much too low, even on the incomplete showing in Owen's list. The astronomical date is to be looked for not only eleven days later, as, for instance, May 17 at Amesbury for May 6, but also eleven days earlier. When immediately before 1752 A.D. the solstice was the eleventh, the date corresponding to our May 6 would be April 26. In 1824 there was a remarkable series of fairs eleven days before the May-year quarter-days proper. This came out while I was searching for some explanation of the strange fact that there is not a single fair on February 4. I find them under January 25. August 5 is the most popular survival of the old August quarter day, and the equivalent of that date is July 25, and that of November 8 is October 29. As the tables given above are sufficient to show the distribution and relative prevalence of May-year fairs, it may suffice to add only the places where the overlooked series of fairs is found.

January 25 (February 4).—Bentham, Bingley, Bodmin, Chesterfield, Churchingford, Derby, Kington (Warwickshire), Weasenham, Whittlesea in the Isle of Ely. (Nine fairs.)

April 23 (May 4).—Bewdley, Billesden, Bruton, Campden, Downton, Finchampstead, Great Bedwin, Hatfield, Hinton St. George, Holywell, Manhineot, Methwold, Norleaze, Oakingham, Sawbridgeworth, Stanaway, Tenbury, Yetminster. (Eighteen fairs.)

April 25 (May 6).—Ashover, Bracknell, Brigstock, Burnham (Essex), Crowborough, Dronfield, Great Oakley, Holt (Norfolk), Iron-Acton, Llandegla, Llannerchymedd, Llanrwst, Limpsham, Loughborough, Medhurst, Methwold, Parkgate, Stoke-under-Hampden, Taddington, Warkworth. (Twenty fairs.)

April 25 and 26 (May 6).—Kendal, Penrith. (Two fairs.)
April 26 (May 6).—King's Norton, Ovingham, Settle. (Three fairs.)

April 27 (May 6).—Axminster, Boroughbridge, Cerrig y Druidion, Dorston (Heref. There is a cromlech there), Holdsworth, Keynsham, Mortimer, Spalding, South Molton. (Nine fairs.)

April 28 (May 6).—Boroughbridge, Cerne-Abbas, Keynsham, Malmesbury, Soham. (Five fairs.)

I claim April 23 because of the popularity of May 4. The two-days' fairs at Kendal and Penrith connect April 25 and 26 with May 5 and 6. I claim April 27 and 28 for a similar reason, namely, that both at Boroughbridge and Keynsham there are two-days' fairs held, which must have been old May festivals. We have the first and the last day of the three-days' festival in the fairs at Methwold on April 23 and 25.

There are only two fairs on August 8; Rhuthin and Shepton Mallet, and there are only two fairs on the equivalent date, July 29, Mountsorrel and Wivelsfield. Mountsorrel is an interesting name, as, I believe, some authorities hold that the wood-sorrel was the original shamrock, which we have reason to claim as a May-year emblematic plant. The great August fair day is the fifth, which we are sure was one day of the August festival because it is coupled with the sixth in two-days' fairs at Ewhurst, Goldsithnay, Louth, and Trowbridge.

July 25 (August 5).—Acle, Alresford, Ashton-under-Lyne, Barnard Castle, Billesdon, Blackboys, Castle-Acre, Little Clacton, Derby, Dunwich, Earith, Gissing, Great Wakering, Hockwold, Ipswich, Leigh (Kent), Lindsey, Liverpool, Middlewich, Milverton, North Down, Reading, Saltash, Seaford, Shoreham (Sussex), Southrepps, Staple, Tiptree Place, Totnes, Tregony, Trew, Wisbech (Isle of Ely), Wells, Yarmouth (Isle of Wight). (Thirty-four fairs.)

July 26 (August 8).—Bewdley, Clare, Great Bedwin, Hastings, Horsemonden, Kirby, Lewes, Llanellian, Llansawel, Leighton Buzzard, Maipas, Mattingley, Newnham (Kent), Portsdown, Sherborne, Tamworth (Staff.), Twyford. (Seventeen fairs.)

July 28 (August 8).—St. Kenelm's, Leek, Manhineot, Week St. Mary, Winchcomb. (Five fairs.) (I claim this date on the strength of the correspondence of the Manhineot July fair with that on April 23.)

The fairs in October are very numerous. From the 20th to the 29th I recognise familiar May-year places, such as Cerrig y Druidion, Sawbridgeworth, and Wells on the 20th; Boroughbridge and Llansawel on the 23rd; Leighton Buzzard on the 24th; Bentham and Wells on the 25th.

October 26 (November 8).—Appletreewick (an excellent name), Grantham, Edwinstone, Llandegla, Llansannan, Ovingham, Pen y Bont (Radnor), Spalding, Warminster, Whittlesea in the Isle of Ely. (Ten fairs.)

October 27 (November 8).—Abergwili, Appletreewick, Caergwle, Cleobury-Mortimer, Darley-Flash, Daventry, March in the Isle of Ely, Nantglyn. (Eight fairs.)

October 28 (November 8).—Alnwick, Askrig, Bangor, East Dean, Llanidloes, Litton, Linfield, Milbourne-Port, Needham, Plympton, Radnor, South Harting, Thirsk, Totnes, Warminster, Whitchurch (Salop), Wigan. (Seventeen fairs.)

October 29 (November 8 strictly).—Abbey-Holm, Amble-side, Askrig, Bourn, Little Brickhill, Bridgenorth, Broadwater, Burton, Chaford, Charing, Chippenham, Clay, Ely, Ewell, Farringdon, Halstead, Hampton (Gloucestershire), Henley-in-Arden, Highworth, Hindon, Holt (Denbighshire), Horncastle, Hunmanby, Kidwelly, King's Cliff, Kirkby Stephen, Saint Lawrence (Cornwall), Marlow, Midhurst, Mongham, Newcastle-upon-Tyne (nine days), Pamphill, Pleasley, Radnor, Sedburgh, Tenby, Thirsk, Tidswell, Towcester, Tunbridge, Uphaven, Usk, Wellingborough Wigan. (Forty-four fairs.)

Without making any further attempt at estimating the number of May quarter-day fairs, we must count nine fairs on January 25 as February 4 festivals; add 57 to the 38

on May 6, in all 95 fairs which are strictly May 6 fairs; add 56 to the 53 on August 5, and regard them all as strictly August 8 fairs; and add 79 to the 43 on November 8, though there are more fairs in October claiming such recognition.

Our lowest possible estimate of true May-year fairs is now as follows:—

	Feb.	May	Aug.	Nov.	Total
	77	416	261	321	1074
Astronomical	35	96	109	122	362

The table of the quarter-day groups must likewise be corrected, only to strengthen materially the whole case for the May-year. (Only in a few cases have I been able to correct Owen's spelling of place-names.)



The Bardic Mystic Sign. (Reproduced from "Barddas." "Morien" quotes Payne Knight's "Symbolical Language of Art and Mythology," pp. 69, 70, where it is stated that the same sign, with a small circle or ring at the converging point of the three lines, is a very ancient emblem in Asia Minor. The angles in Knight's sketch, as reproduced by "Morien," are also exactly 28° each.)

George Meredith makes one of his Welsh characters "think in triads." Here is a new triad:—"The three interpreters of the riddle of the stones: the Sun, the Gorsedd, and the Popular Fair." I have already shown (NATURE, May 2) that the May year is the true basis of the Gorsedd. The bardic *Nôd Cyvrin*, Mystic Sign, which Mr. A. L. Lewis (NATURE, June 6) associates very naturally with the "broad arrow," is really a miniature Gorsedd. I have tested several printed cuts of the sign and find the angles to be 28°, that is, regarding the middle line as an east-west line, the right line points to N. 62° E. and the left to S. 62° E., the only possible emblematic representation, in the simplest form, of the May year in the Gorsedd country.

JOHN GRIFFITH.

KATHODE RAYS AND THE AURORA.

THE idea that kathode rays play a part in aurora has been advanced by several physicists. Prof. Kr. Birke-land ("Expedition Norvegienne," 1899-1900, Christiania, 1901) has described a number of phenomena produced by kathode rays in the neighbourhood of a magnetised sphere, which resemble various types of aurora. He supposed the sun to be a primary source for kathode rays, which might set up secondary rays in the earth's atmosphere. Mr. C. Störmer has carried out elaborate calculations as to the possible ways in which electrified particles coming from a great distance can approach a magnetised "earth"; his

which is parallel to the lines of magnetic force. The radius of the cylinder varies directly as the component of the velocity perpendicular to the lines of magnetic force, and inversely as the intensity of the field. Suppose, however, that the magnetic field is not uniform, but increases in intensity in the direction in which the ion travels; then, as has been shown by Poincaré, the path forms a curve with diminishing spirals on a cone, and before actually reaching the summit of the cone the particle ceases to advance, and retires, the spirals gradually opening out. If, for instance, the field is that due to two elongated parallel poles, then if the particle gets under weigh between the poles, travelling obliquely to the lines of force, there is a regular game of battledore and shuttlecock, the particle zigzagging to and fro slantwise, reversing its direction whenever it gets within a certain distance of either pole.

M. Villard supposes ions to get in motion somewhere in the earth's atmosphere. As to exactly how this comes about he is not prepared to dogmatise. He is inclined to think that cirrus clouds—which he believes to consist of ice particles negatively electrified—under the influence of ultra-violet light, or less probably under a solar bombardment such as Arrhenius postulates, are probable sources. He also thinks that not improbably a part is played by cosmical dust encountered in the earth's movement through space. Ions starting, say, from a cirrus cloud, and moving obliquely to the lines of magnetic force in the earth's atmosphere, will travel each in a spiral, the whole together forming a sort of luminous spindle, which on getting within a certain distance of, say, the south magnetic pole, turns as if reflected, makes for the north pole, suffers a second reflection there, and so on. Fig. 1, copied from M. Villard's paper, represents the idea diagrammatically. The particles are supposed to come in at the top (answering to the west) and first to travel south. The movement may be supposed to be set up by ultra-violet light from the sun falling on cirrus. The first band or two will thus be in the still illuminated hemisphere, and so invisible; succeeding bands will be overhead in the unlighted hemisphere, and will be visible. Passing further to the east, the energy will be gradually dissipated and the aurora cease to be visible, thus explaining why the late evening, and not the morning, is normally the time of most brilliant aurora.

To fit the theory, the charge carried by the particles must be negative. If it were positive, the motion would be from the east, and the principal aurora would be in the early morning. Fig. 2 reproduces a photograph showing the actual appearance near a magnetic pole from one point of view, in one of M. Villard's experiments. He regards the intensifications of brightness, due to the superposition

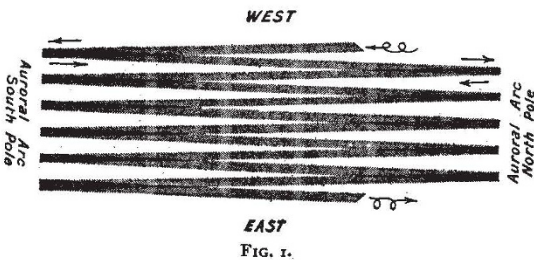


FIG. 1.

results tend to limit the approaching particles to the space near the magnetic poles. Prof. S. Arrhenius has supposed electrified particles to be driven from the sun by the repulsion of light and to reach the earth's atmosphere in about two days, originating aurora and magnetic storms.

M. Villard refers to Arrhenius's theory, but seems somewhat sceptical as to the supposed solar origin of the electrified particles. His own views appear to be a combination of theory and observation as to what happens to ions or electrified bodies of any kind moving in a magnetic field. In a uniform field the ion, when travelling with uniform velocity, describes a regular helix on a cylinder the axis of

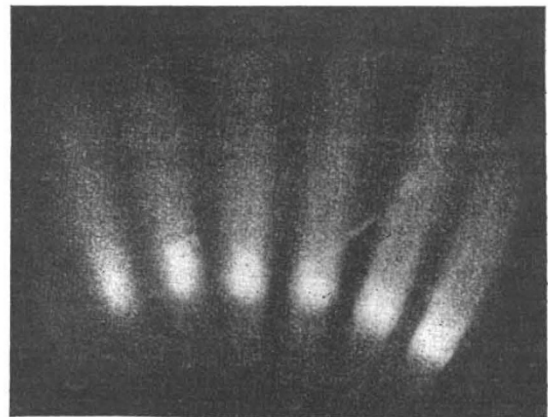


FIG. 2.

of the direct and return paths, as answering to an auroral arc. Below the arc there would, he says, be total darkness—answering to the "dark segment" of the ordinary aurora—but for a special form of discharge which he terms "magneto-kathodic" rays; these rays require, he says, a very steep potential gradient, and do not exist in the earth's atmosphere. Changes in the magnetic field or

¹ "Les Rayons cathodiques et l'Aurore boréale." By M. P. Villard. (Bulletin de la Société d'Encouragement pour l'Industrie nationale, May, 1907.)