

# A MERIDIAN DIAL IN A SUBSCRIPTION LIBRARY, NOTTINGHAM

DOUGLAS A. BATEMAN

## Summary

In a large Georgian town house in the centre of Nottingham is the brass strip of a meridian dial that was installed in 1834. The strip, and a vertical line on wood, is on the first floor of a library, but the wooden board with an aperture is missing. The strip is in very good condition, and is supplemented by two longcase clocks that have been inscribed with tables of longitude and time differences. The brass strip has been covered over for many years and only quite recently has the significance of the dial been realised. Steps are in hand to make a partial restoration of this rare form of dial, which is in excellent condition in the finest surroundings.

## Bromley House

In 1752 George Smith, the grandson of a local banker, built an elegant town house, called Bromley House, in the centre of Nottingham. Externally, it appears fairly plain (Figs 1 and 2), but internally, the house is distinguished by having a grand main staircase with glazed lantern in the roof. The rooms are large and well proportioned, many with plaster decorated ceilings, and large fireplaces.



Fig. 1 Bromley House, Angel Row, Nottingham. Built in 1752.

The house had various owners for its first 70 years. In 1819 it was even used to billet soldiers: contemporary records give details of furniture being supplied for the officers and of damage done by the soldiers. Architecturally the house has suffered few major alterations, and one notable addition, in 1857, was an elegant spiral staircase to link two floors in the library. The staircase is unusual in that it has no central column and rises in one complete revolution with a short straight section.



Fig. 2 Rear view of Bromley House. The meridian line is in the room with the shutters partly closed: the aperture will have been in the upper part of this window.

## Subscription Library

The desire amongst the professional classes for access to books was increasing during the early nineteenth century and in 1816 a subscription library was formed by distinguished members of the community. When Bromley House came on the market in 1820 it was purchased to give a permanent home for the growing library. The library has continued, and has a strong and active membership. The library, in turn, is a member of the Association of Independent Libraries.

From the beginning, members of the library maintained a very strong interest in the sciences. It is a matter of pride that the library supported, through access to books and help with financing publications, the mathematician and Nottingham miller known as George Green. Green was a member of the library from 1823 to 1833, before he went to Cambridge University. In 1828 he published a paper on *The Application of Mathematical Analysis to the theories of Electricity and Magnetism* and his invention of a class of differential equations and 'Greens's functions' have placed him on the first rank of mathematicians.

In celebration of the 175th anniversary the library published a booklet about Bromley House<sup>1</sup>. This 137 page booklet is a model of historical recording with 4 lengthy essays followed by extensive references, appendices and index. The booklet is an important link in the history of the dial.

### The meridian dial

It must be assumed that after several years of use, the brass strip was covered over by carpets or linoleum for about 150 years. There has been no mention of a meridian dial either in Nottingham itself or in the general sundial literature, and apart from the early minutes of meetings in the library, the first formal record was in 1916 in the relatively obscure history of the library by Russell<sup>2</sup>, and then again in the more accessible booklet mentioned above, in 1991. My own involvement came in 1997 when the assistant librarian, Adele Pucci, drew my attention to the booklet and arranged for me to see the dial. A very small portion of the brass strip could be seen in the corner of a doorway at the foot of a hint of the vertical line. In January 1998, the library authorities took the bold step of uncovering another metre of the brass strip. As part of a publicity campaign for the library, a very good feature on the dial appeared in the Nottingham Evening Post on 3 March 1998. It may have been this article that led one of Green's Mill scientific staff, Denny Plowman (see Note 1), to inform Peter Ransom, who in turn, mentioned the dial in his privately published booklet on sundials<sup>3</sup>. Although the dial was noted in the chapter on analemmatic dials rather than meridian dials, the Bromley House dial has a specific mention.

For details of the dial, and context, I quote directly from the second essay (by Neville Hoskins) in the anniversary booklet, pages 66-67.

The members of the Library, in the early days of its existence, were extremely interested in scientific matters. They installed a remote indicating weather vane, though the date of this is not known. This was mounted on the roof, and connected by an ingenious system of rods to dials beside the fireplace in the main library room and the room below. As early as October 1832 it must have caused problems. The Committee instructed that 'the weather vane rod be taken down', but its repair was ordered two years later. The dials still exist, though they are no longer connected to the vane.

In those days clocks and watches were set to local time and, in order that they may be checked, there was installed in the Standfast Room a device by which Local Apparent Noon could be ascertained. Russell (*the booklet gives a reference to the earlier history*)

describes a 'wooden shutter-like erection fixed on the outside of the southern window and pierced by a small hole through which the sun would send a beam of light' Precisely at true solar noon the beam of light would cross the brass strip fixed to the floor. Associated with the strip was a plumb line suspended on a door frame in the north corner of the room. This strip survives though hidden by floor coverings, as does the recess housing the plumb bob. The function of the plumb bob is not clear; the brass strip alone would suffice to determine noon. Why a further marker was needed, and a plumb bob at that, is a matter of conjecture. Written notes of observations and clock errors, dating from the early days of the nineteenth century, are among the Library records. Both the longcase clocks in the library have inscribed on their faces a table of time differences between Greenwich and St Mary's Nottingham (4 minutes 33 seconds), and other locations in the Midlands.

Later, in the third essay (by Stephan Mastoris) on pages 93 and 95, there is some additional information

This interest in science and society amongst the membership led to a fascinating assortment of furniture and fittings being purchased for the library, especially after its move to Bromley House. Soon after moving, the Committee purchased not only a clock but also a barometer, a thermometer and a pair of globes, ..... What was to become an abiding interest in meteorology was enhanced by the fitting of a wind dial and index in the library reading-room which was connected to the weather vane on the roof. In 1834 one of the library's most intriguing features was created in the Standfast Room, - the Meridian Line marker referred to in Neville Hoskins' contribution. This equipment was complemented by the erection of a sundial in the garden in 1836. (*This dial has since disappeared, and the globes had been disposed of: my italics.*)

I quote again, this time from the minute books.

At the 293rd Meeting of the Committee held September 1st 1834. The Rev R W Almond in the Chair. Resolved that the Meridian Line in the Standfast Library lately verified by Mr Bell and Mr Jackson be laid down in brass at the expense of the Institution...

As recorded above, the meridian line is installed in a small room in the library known as the Standfast Room. Fig.3 is a plan view. The strip is 6.69 metres long and 50 millimetres wide. The central line is deeply cut in the brass. Fig. 4 shows a general view. The location of the plumb bob

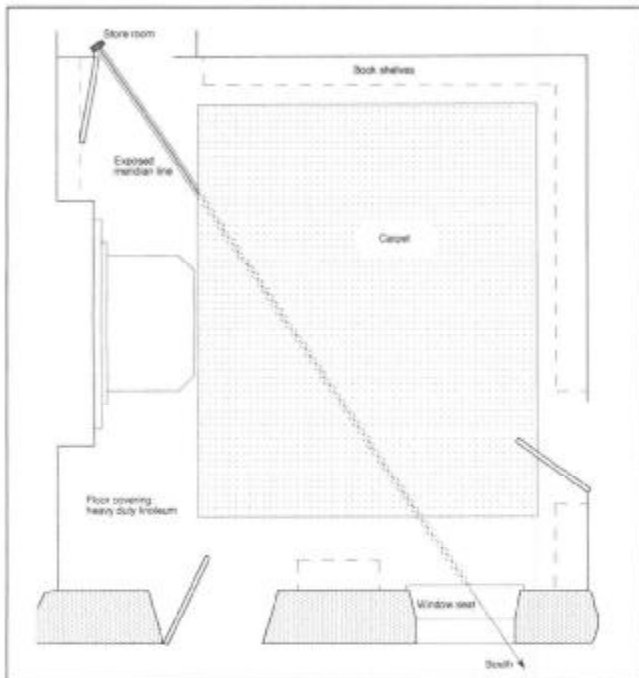


Fig. 3 Plan of the Standfast Room. From this plan the meridian line is at an angle of  $55.3^\circ$  to the wall.



Fig. 4 The meridian line emerging from under the carpet below the table. The vertical continuation is on a specially fitted wooden board and is revealed by opening the store room door.

can be clearly seen in Fig. 5, and with oblique lighting, a vertical line can be detected in the substantial wooden board that adjoins the doorframe. For the photograph, the

lines were emphasised with a 'dry marker' pen (the lines were afterwards removed with a soft cloth). The essayist in the Bromley House booklet was puzzled as to why the plumb bob should have remained at it serves no useful purpose. It is a matter for conjecture, and my own opinion is that the instruction to the carpenter to have this part of the meridian line vertical may have been so emphatic that the carpenter misunderstood this for inclusion of the bob as well. The line even extends to the top of the door frame!

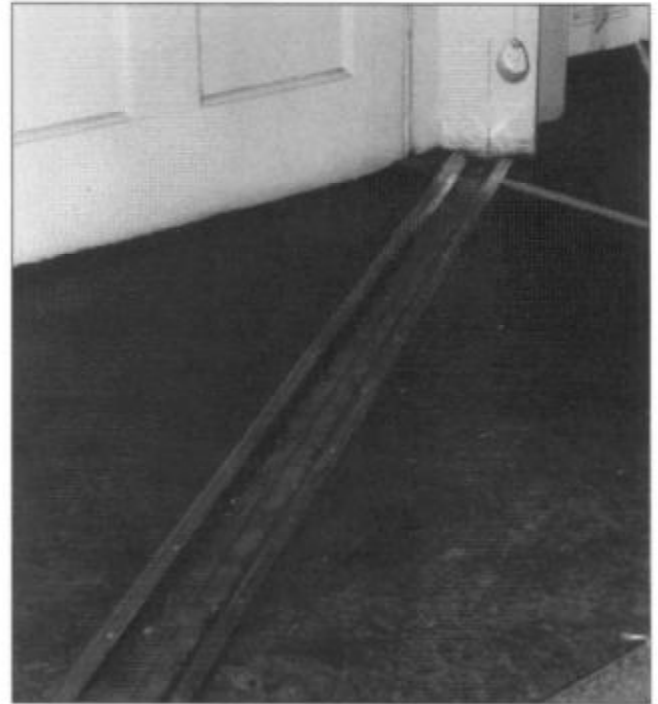


Fig. 5 The vertical line and recess for a plumb bob. The metal edging was fitted in 1998 after the linoleum was cut to reveal more of the brass meridian line.

The brass strip is in very good condition, and although the meridian line is clear, on the part that is exposed there seems to be no evidence of other marks that would indicate specific dates or the months - see Figs. 6 and 7.

The aperture must have endured the weather for over 80 years as Russell<sup>2</sup> reports it as being in place at the time of writing his History in 1916. No records exist of its removal, and the need for the dial was overtaken by telegraphed time signals, or an earlier lack of interest. Either way, members may have complained of the screening of daylight, a valuable commodity, by a large board in the window. However, there is some external evidence in the form of the remains of a wooden 'plug' for a screw or nail high on the brickwork of the window. On the same side there is a hint of paint in a vertical line, consistent with repainting the board at some time. Brickwork on the other side has been re-pointed, but there is extra mortar where a plug may have been. Figure 8 is a 'sectional' view showing where the spot of sunlight may have fallen, assuming the aperture to be in line with the panel fixings.

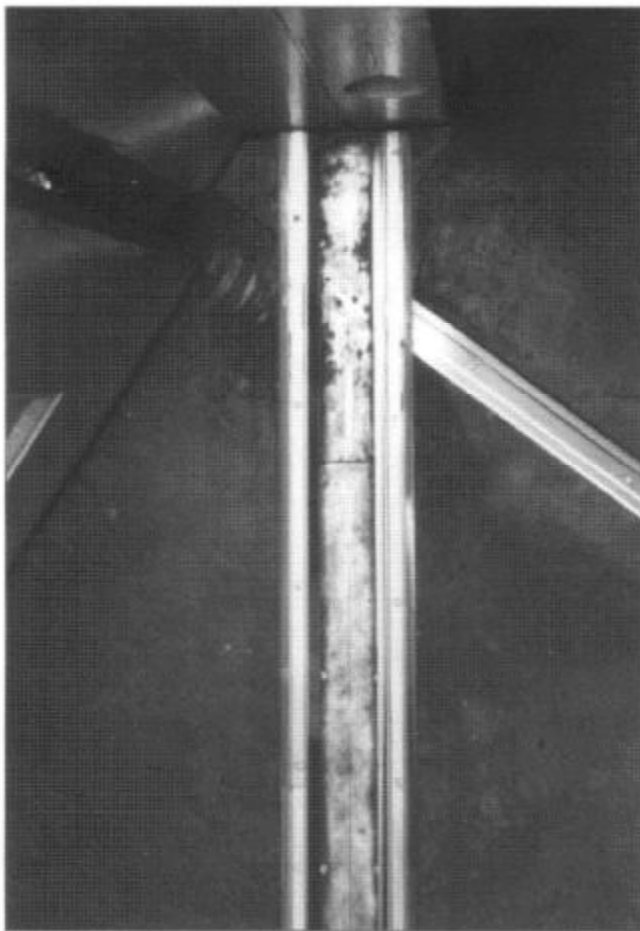


Fig. 6 Prior to 1988 the only part of the brass strip that was visible was a small portion just inside the storeroom door. The strip was covered over by linoleum, almost certainly well before 1916.

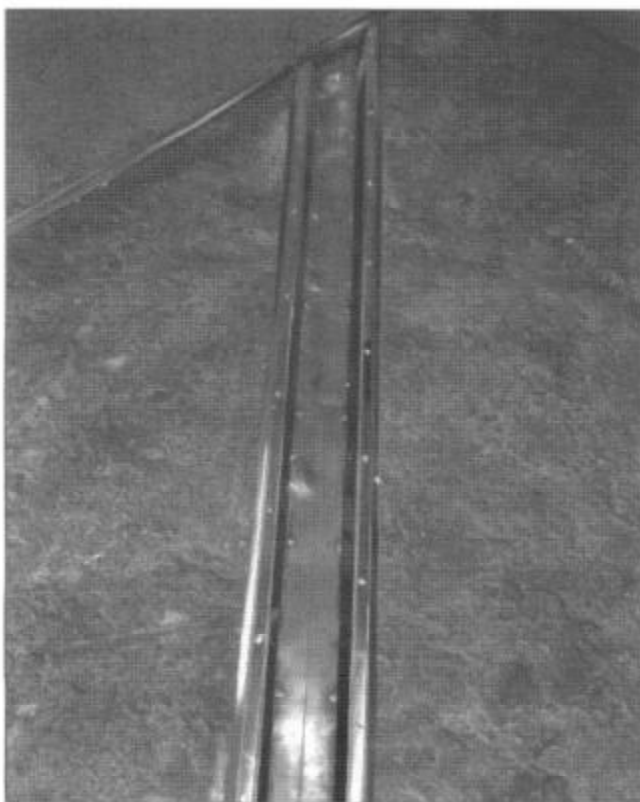


Fig. 7 A view of the brass strip looking towards the window.

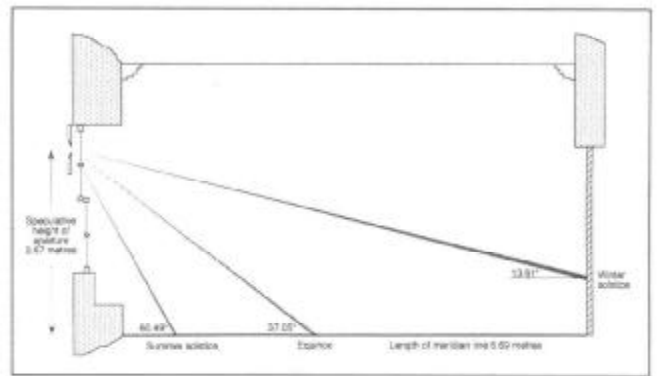


Fig. 8 A 'sectional' view. The height of the aperture is assumed to be on the same horizontal line as the fixing holes in the external brickwork.



Fig. 9 The white dial clock of 1780-90. Note the unusual two square apertures in the trunk. In the arch is a plate added later. It gives latitudes and longitudes as shown in Appendix 1.

#### The longcase clocks

As part of its timekeeping interests, the library has not one but two specially marked clocks. The first is an anonymous provincial white-dial clock dated, from the style, at about 1780-90. It has a recoil escapement and strike, and the dial is very plain and undecorated. The two most distinguishing features are an engraved panel above the dial that lists





Fig. 10 The disc with time differences between Nottingham, Greenwich and St Paul's.

latitude, longitude and time difference. See Figs. 9, 10 and appendix 1.



Fig. 11 The 1830 Whitehurst regulator.

A second clock, of better quality with dead beat escapement, but without temperature compensation, had been commissioned from Whitehurst of Derby. This has been engraved directly on the dial with latitude, longitude and time differences from Greenwich and St Paul's Cathedral. See Figs. 11, 12 and appendix 2. The date, 1830,

predates the recorded installation of the meridian line by 4 years, but it may well have been part of the overall planning for time-keeping. The functional inscriptions for latitude, longitude and time differences are extremely rare features in themselves. This clock, consistent with its discreet and sheltered existence, has escaped the attention of researchers and is not mentioned in the recent extensive study on John Whitehurst and his dynasty by Craven<sup>1</sup>.

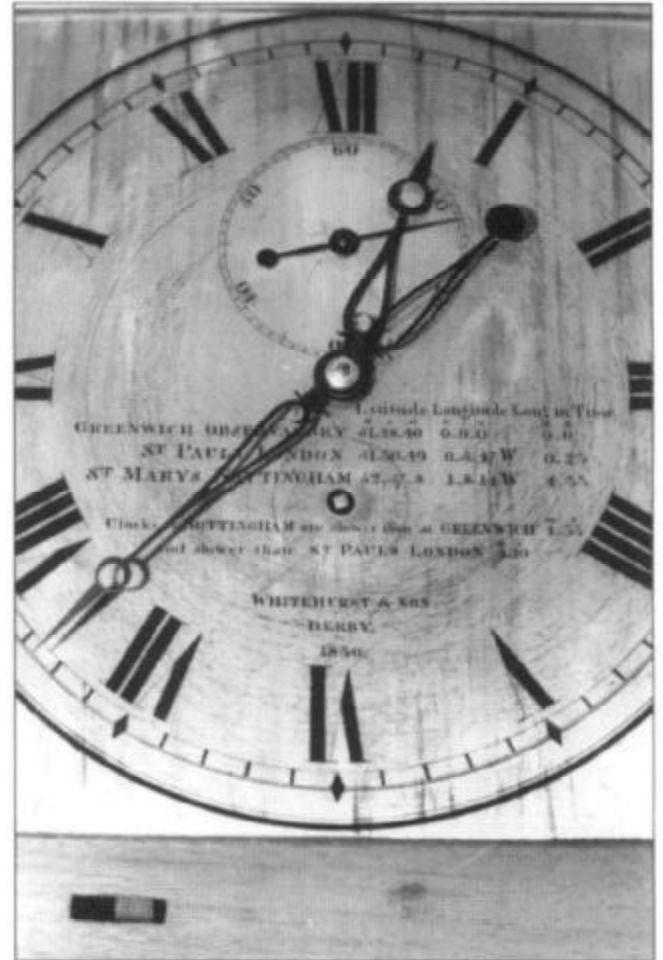


Fig. 12 Latitudes, longitudes and time differences engraved directly on the dial plate.

#### Latitude and Longitude

The precision with which the various latitudes and longitudes are quoted, and the mention of Colonel Mudge on the first clock, invites comparison with modern values. From a 1:25,000 scale map the latitude and longitude of Bromley House is 52° 57' 12" N and 1° 9' 3" W. For St Mary's Church the respective values are 52° 57' 31" N and 1° 8' 29" W. The differences from the early surveys for St Mary's are 5" latitude and 15" in longitude (155 metres and 280 metres respectively).

These differences are trivial from a sundial point of view, and the modern longitude alters the time difference between Greenwich and St Mary's by only one second of time to 4min 34sec (Bromley House is 4min 36sec after

## Appendix 1

Inscribed on the white dial striking clock

LATITUDES AND LONGITUDES  
from the Trigonometrical Survey of England  
and Wales by COL. MUDGE and others

Names of Places	Latitudes			Longitudes West of Greenwich				
	°	'	"	°	'	"	m	s
Greenwich Observatory	51	28	40	0	0	0	0	0
London S <sup>t</sup> Paul's	51	30	49	0	5	47	0	23
Lincoln Minster	53	44	7	0	32	1	2	8
Bottesford Church	52	56	40	0	47	45	3	11
Newark Church	53	4	30	0	49	18	3	17
Langar Observatory	52	55	3	0	51	27	3	26
Bingham Church	52	57	12	0	56	38	3	47
Nottingham S <sup>t</sup> Mary's Ch	52	57	8	1	8	14	4	33
Loughborough Church	52	46	31	1	11	54	4	48
Derby All S <sup>n</sup> Church	52	55	32	1	28	16	5	53

CLOCKS  
at Nottingham  
are slower  
than at Greenwich  
4 min<sup>r</sup>. 33 sec<sup>s</sup>.  
and slower than  
St Pauls London  
4 min<sup>r</sup>. 10 sec<sup>s</sup>.

## Appendix 2

Inscribed on the Whitehurst clock

	Latitude			Longitude			Long in Time	
	°	'	"	°	'	"	M	s
Greenwich Observatory	51	28	40	0	0	0	0	0
S <sup>t</sup> Pauls London	51	30	49	0	5	47W	0	23
S <sup>t</sup> Marys Nottingham	52	57	8	1	8	14W	4	33

Clocks at Nottingham are slower than at Greenwich 4<sup>m</sup> 33<sup>s</sup>  
and slower than S<sup>t</sup> PAULS LONDON 4<sup>m</sup> 10<sup>s</sup>

WHITEHURST & SON  
DERBY  
1830

Greenwich). From a map-making perspective, however, the errors are quite significant, and cannot be explained by the successive eastwards shifts of the Greenwich meridian due to new locations of transit telescopes after Flamsteed, Halley, Bradley and Airy. In fact the Bradley telescope was taken as the reference for the original triangulation of Great Britain between 1783 and 1853. When Airy's meridian was set up some 19 feet to the east it appears that the Ordnance Survey did not amend their records and the re-triangulation of 1936 to 1957, linked to Airy's meridian, appeared to reveal a large discrepancy. Further checks reduced the difference to 1.95 metres in longitude<sup>5</sup>.

The Colonel Mudge mentioned on the white dial clock was William Mudge who was appointed as the second Superintendent of the Ordnance Survey in 1798. He was made a Fellow of the Royal Society in the same year. Mudge had been extremely successful in mapping a large part of the British Isles, but it was known that errors existed. The second superintendent, Captain Colby, urged resurveying, and payment to contractors that encouraged accuracy rather than speed. In a letter to a customer to explain the problem of representing part of the surface of a sphere on a flat sheet, Mudge himself explained that to introduce as little error as possible due to convergence, three meridians were established, one for the centre of the British Isles, the other two for the east and west<sup>6</sup>.

It should not be surprising that latitudes and longitudes should contain errors, or should be subject to redefinition. In the latter part of this century we now have the satellite based Global Positioning System. To give a global 'best fit' around the earth, the zero meridian has moved again, this time a further 102 metres east. The Bromley House position (by conversion from the Ordnance Survey) under the GPS reference system, WGS84, is 52° 57' 13"N and 1° 9' 9"W.

### Conclusion

Meridian lines in Italy and France have reported by Aked<sup>7</sup>. In addition, Aked mentions a line in a library floor at the University of St Andrew's in Scotland. However, this line was set out, in 1748, purely as a meridian for astronomical purposes: being without an aperture it would not have served as a noon time dial<sup>8</sup>.

In the British Isles, meridian lines that serve as noon dials, and that are mostly horizontal, are very rare. There is one in Durham Cathedral, and a partially restored line in Ramsgate<sup>9</sup>. To have a line, still with its brass strip, and with accompanying longcase clocks, in surroundings of such charm and elegance, is unique indeed.

### Note 1

Green's Mill is a traditional tower windmill built of brick, some 1.5km east of Bromley House. The mill was built in 1807 by George Green Sr. It ceased milling in 1867. It was restored in 1979-86 to be in full working order. There are 'milling days' and the adjacent buildings house an educational and 'hands-on' scientific centre.

### References

1. Rosalys T. Cooper and Jane Y. Corbett: *Bromley House 1752-1991: Four essays celebrating the 175th Anniversary of the foundation of The Nottingham Subscription Library*, Nottingham Subscription Library, 1991.
2. John Russell: *A History of the Nottingham Subscription Library*, Derry & Sons, Nottingham, 1916.
3. Peter Ransom: *A Dozen Dials*, P H Ransom, Southampton 1998.
4. Maxwell Craven: *John Whitehurst of Derby, Clockmaker and Scientist 1713-88*, Mayfield Books, Derbyshire, 1996.
5. Derek Howse: *Greenwich Time and the Longitude*, Philip Wilson, London, 1997.
6. Tim Owen and Elaine Pilbeam: *Ordnance Survey, Map Makers to Britain since 1791*, HMSO, 1992.
7. Charles K Aked: 'Meridian Lines, the 1997 Andrew Somerville Memorial Lecture', *Bulletin of the British Sundial Society* 97.3, pp24-28, July 1997.
8. Kenneth C Fraser, Senior Assistant Librarian, University of St Andrews, private communication, January 1999.
9. M R Norris: 'Meridian Line at Ramsgate', *Bulletin of the British Sundial Society* 96.2, pp26-28, June 1996.

D.A.Bateman  
4 New Wokingham Road  
Crowthorne, Berks, RG45 7NR

John Davis tells us that the Ventnor (I.O.W. town council is Thinking Big about a millennium project: a massive sundial on the cliff above the Eastern esplanade. Our village Parish Council is Thinking Smaller: a vertical dial on the front wall (S dec.40°E) of the Primary School.