

The ancient sundials of Scotland

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SUMMARY

Scotland has a rich heritage of 'Renaissance' sundials which are more numerous than in any other country. These are free-standing stone sculptures dating from the 17th and early 18th centuries, with many dials inscribed on them, often in shapes which may have symbolic significance. A catalogue has been prepared including those which have been recorded in the past and have now disappeared, as well as those which still survive. The various types are described and comparisons made with those in other countries, showing the unique character of the Scottish style. The reasons for their appearance in Scotland at this time are first of all material: more stable government and increased prosperity led to the building of mansion houses with pleasure gardens. Secondly, the Calvinist philosophy of the time frowned on decoration for its own sake and required function as well. Thirdly, interest in science was increasing, along with the Renaissance interest in re-discovering the esoteric knowledge of the ancients. In addition, freemasonry may have had its beginnings in Scotland in the late 16th century and certainly assumed considerable importance in the 17th; this is unlikely to be mere coincidence and the dials probably had a significance which went well beyond simple time-keeping.

The main listing of the catalogue is given in microfiche form, but summaries are printed.

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INTRODUCTION

Under the above title, nearly 100 years ago, Thomas Ross gave in these *Proceedings* (Ross 1890) an account of Scottish sundials which still stands today as one of the most thorough surveys of its kind in any country. Attractively presented with numerous line drawings, its material has been used extensively by other authors, notably in the later editions of Mrs Gatty's *Book of Sundials* (Gatty 1900), but little new information has been added to it. It was reprinted, with minor amendments, as an appendix to *The Castellated and Domestic Architecture of Scotland* (MacGibbon & Ross 1892). At the end of that article Ross says

. . . the earliest of these dials are among the most complicated of their kind. This seems to indicate that the art was imported into this country in a highly advanced state, and had probably been developed abroad; but till foreign dials have been examined and classified, we cannot say positively where the ideas were derived from, nor how far the foreign models were followed.

In recent years there has been a revival of interest in sundials, especially on the continent of Europe, and there are now active study groups in Holland, East and West Germany, France, Italy and Hungary, though not, as yet, in Britain (see appendix). These groups have produced, or are working on, lists of the dials in their own countries, with the result that it is now possible to make the sort of comparison which was not available to Ross. The purpose of the present study is to update the work of Ross, adding dials which he had not seen, tracking down those which have been moved since his day, and to attempt a comparison with English and continental dials, with some speculations as to the origins of the dials and why they should have become so popular in Scotland.

It may be stated at the outset that there is good reason to believe that dials of the complex, polyhedral types are both more numerous and more elaborate in Scotland than in other countries and that one particular type, the obelisk, is unique to Scotland. At the end of this article I have listed, in microfiche form, all the Scottish polyhedral dials known to me at the present time, including those described by other authors which may by now have disappeared. I have not attempted to include ordinary 'garden horizontals' or dials attached to buildings as these are too numerous and usually belong to types which can be found in most European countries. In discussing the polyhedrals I have followed the classification of Ross into three main types: *lectern*, *obelisk* and *facet-head*, although the latter is rather a catch-all term which includes a wide variety of sub-types not covered by the other two. The list includes about 330 entries and the greatest concentration is in the highly populated belt across the middle of the country, between Glasgow and Edinburgh. At least 47 of them can be dated to before 1700 (though many more, which are probably as old, are undated), and the main dial making period was from 1623 to about 1731, so it was a relatively short-lived fashion.

DESCRIPTION

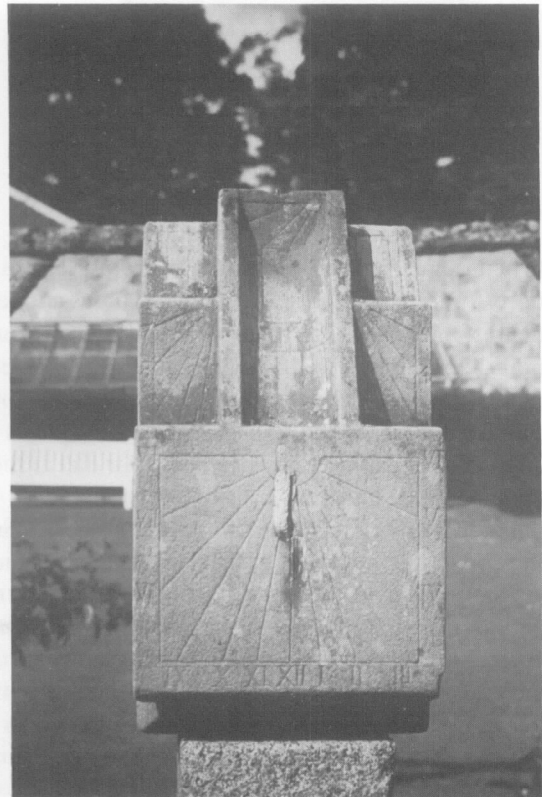
1 LECTERN DIALS

Taking the lecterns first: these are characterized by a sloping top like a reading desk, in the equatorial plane, usually with a star on top having dials in all its angles, and at 90° to this is a hemisphere with a polar dial inscribed in it (sundials are usually classified by the plane of the dial plate: thus, 'equatorial' means that the surface marked with the hour lines lies in the plane of the equator, whereas 'polar' means that it lies in the plane of the polar axis). The lectern usually has hollow dials on the south, east and west faces, and hour lines are inscribed in every available angle. One of the finest still existing is at Ladyland House, Ayrshire (illus 1). There are a few simple ones, for example at Castle Fraser (illus 2), which are basically cubes with a sloping upper surface having no star: it is tempting to look on these as early stages in the development of the full-blown lectern, but none of them is dated and, as we shall see, the lectern of earliest known date is already very elaborate, so the simpler versions may only be the product of less skilled masons. In the more complicated examples, such as the one noted by Ross at Mid Calder House and now at Culzean Castle (illus 3), the lectern may be mounted on another block, sometimes octagonal, sometimes square and often with corners cut away to form reclining or proclining dials. In this way the number of dial faces may be over 50, some with inset metal gnomons, others with gnomons formed in the stone.

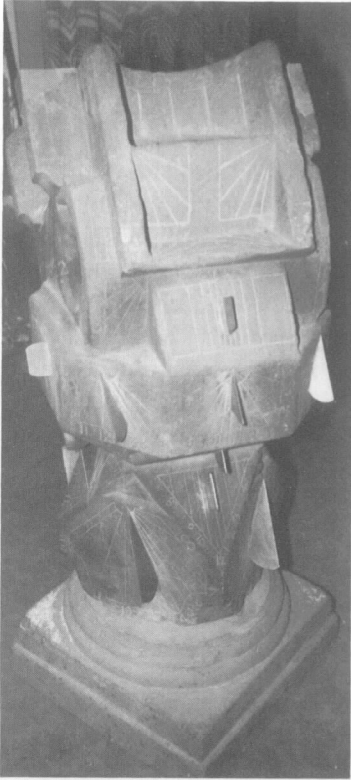
Since the workings of these multiple dials are often regarded as mysterious, especially when the metal gnomons have been broken off and the hour lines and numbers worn away or obscured by



ILLUS 1 Lectern dial, Ladyland House, 1673



ILLUS 2 Lectern dial, Castle Fraser



ILLUS 3 Lectern dial, Culzean Castle
(Photo: G Higgs)

lichen, some explanation may be appropriate here. Illustration 3 shows the Culzean dial in the course of restoration and the new copper gnomons and re-engraved hour lines can be clearly seen. The side nearest the camera has three polar dials, facing south but inclined at the angle of the latitude and with hour lines parallel to the gnomon, as well as three ordinary vertical dials. Others face the cardinal points of the compass or intermediate positions, some at reclining angles, but all the gnomons point to the North Star, so that the shadow-casting edges are all parallel to each other, no matter what the angle of the dial face may be. The polar dial at the top and the vertical dials below it have no metal gnomon: the shadow is cast by the stone edges of the hemi-cylinder which encloses them. Each individual dial is thus very simple, the shadow being read against the hour lines in the ordinary way: the apparent complexity at first sight is merely due to the number of them present on the one block. As the sun moves round during the day, the different faces of the block will be exposed to it in turn and all the dials illuminated should read the same time. This fact can be used to orient the block correctly. It is perhaps worth pointing out that the special appeal of these dials is not due to the amount of astronomical information they can give – they show no more than local time and the position of the sun in the zodiac and many later, or even contemporary, dials are much more complex in this respect (see, for example, Rohr 1986) – but rather in the ingenuity of their sculpture. To the modern student, accustomed to the pocket calculator and home computer, setting out the hour lines would be an elementary exercise in trigonometry, but the logarithms of sines were only published in

1614 by Napier, followed in 1617 by Briggs with the common logarithms of whole numbers, and although the advantages of trigonometric methods were quickly perceived by navigators, books on dialling continued to use geometrical methods until much later. Working masons, however, would not have needed to understand the mathematics since various mechanical devices were available for drawing the lines, usually based on a simple equatorial dial, on which the hour lines are drawn at regular 15° intervals and can then be projected on to other surfaces using threads (see Zinner 1979, 73–4 and Cousins 1969; for geometrical methods see Drinkwater 1985). In 1597 David Anderson

hade devysit ane instrument, of his awin ingyne, to draw and mak dyellis or sone horolages

and he offered to make one on a public building in Aberdeen

quhilk suld schaw houris verie justlie be the sone, with every moneth of the yer, the langest, schortest, and equinoctiall dayis (Turreff 1859).

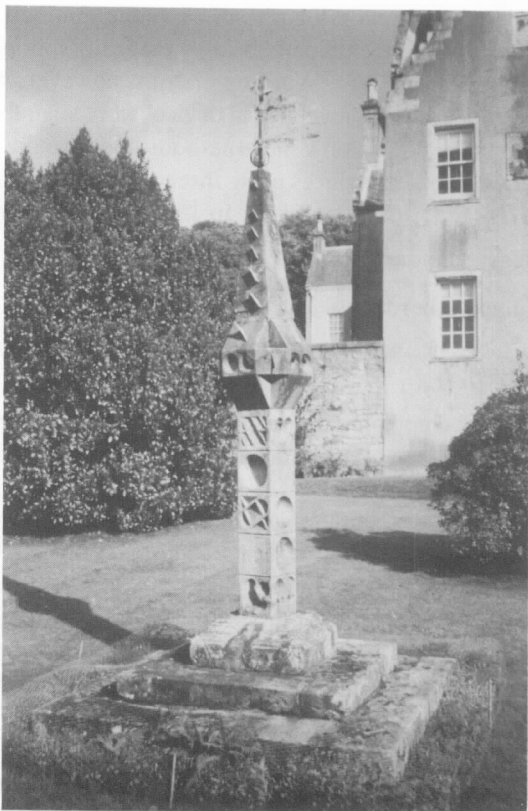
Since he did not require payment until the work was completed to the satisfaction of the baillies, the offer was accepted! This ingenious individual was known as ‘Davie-do-a’-thing’ and he later became City Architect of Aberdeen.

Ross has suggested (MacGibbon & Ross 1892, 422) that the shape of these lectern dials may be derived from astronomical instruments such as the torquetum of Apian, illustrated in Holbein’s painting *The Ambassadors*, but I do not find this analogy convincing as the torquetum has no equivalent of the hollows which are such a characteristic feature of the lectern, and it is essentially a mobile instrument, designed for sighting the heavenly bodies, in strong contrast to these massive stone sculptures, which face immutably in one direction. The lecterns are also sometimes called ‘masonic’ dials and the possible significance of this will appear later.

Another class of dial which may be considered along with the lecterns, as they are set up at the equatorial angle, are the sun, moon and tidal dials of John Bonar, Master of the Grammar School at Ayr from 1612 to 1638. Four of these are known and one of them, from Kenmure Castle, dated 1623, ranks along with the lectern from Dundas Castle as the oldest in the country to be dated with certainty. All are inscribed with the names of ports, arranged according to the ‘port establishment’, and they would have had movable arms (now missing) to set to the age of the moon, so that they could be used as moon dials and also for predicting the time of high tide. They have counterparts in the portable tide calculators used by seamen in the late 16th century (Waters 1978, 504). A fifth dial of this type, but inscribed ‘*sculptum per Iacobum Broun, 1636*’ is in Kirkcudbright Museum. They have been described fully elsewhere (Somerville 1986).

2 OBELISK DIALS

The lecterns have some counterparts on the continent, but the next class of dial, the obelisk, seems to be unique to Scotland – at any rate, I have yet to find anything like it elsewhere. One of the best preserved is at Kelburn Castle, Ayrshire (illus 4), dated 1707. The obelisk divides conveniently into three parts: first, a square shaft divided into four or five square panels on each side, most of which have sunk dials in the form of bowl-hollows, hearts or triangular and rectangular shapes, making a total of up to 20 dials on the shaft alone. Above the shaft comes a capital, or boss, which is octagonal in section with upper and lower edges sloped off to form 24 planes in all. The corners may be cut away and have dials inscribed in the hollows. The plane surfaces may have bowl-hollows and other sinkings with dials inscribed in them. On top comes a tapering finial which gives the name ‘obelisk’ to the type. It is also divided into panels; up to seven or eight on each side, with dials in each one, so that on the whole structure there may be 70 or 80 surfaces available for the inscription of dials. Gnomons on the shaft are usually formed in the stone, but the others may be of metal. Variations are found in the boss:



ILLUS 4 Obelisk dial, Kelburn Castle, 1707

the dial at Wemyss Castle (formerly at Invermay, Perthshire, illus 5) has the central, octagonal band omitted, resulting in a 'wedge' shape, while the one at Kirkton Hall, West Kilbride, has upper and lower corners which meet in a point, so that the central band has only four vertical faces and four points. It is not possible to say that these are development stages; more likely they are local variations produced by different sculptors. There are also some partial examples which look like full dials sawn in half, for example, the dial at Auchenbowie, Stirlingshire (illus 6) with an ordinary horizontal on top, but whether they were originally made like that or cut down after being damaged is not known. Being tall and thin, the obelisks are particularly easily damaged and horses and cows have been known to knock them over. Also, the various parts of the stone are usually joined by iron dowels and if water gets access to these and rusts them, the stone can be badly cracked. Masons who repair them do not always appreciate the relationship of the various sections, and more often than not one finds that, for example, the south face of the boss is mounted over the west side of the shaft and the finial is back to front.

Ross himself made a number of interesting reconstructions and a unique example of his work is at Carberry Tower, outside Edinburgh (illus 7). He found an isolated obelisk boss (referred to in MacGibbon & Ross 1892, 421) which was pierced and hollow in the centre, supported by a vertical dowel, and he mounted this on a new shaft with a matching finial above. As the wall of the hollow stonework is thin, the dial patterns of the boss are raised rather than sunk and those of the shaft and



ILLUS 5 Obelisk dial, Wemyss Castle

finial are raised to match, though they have not been marked as dials (this boss is quite unique, however, which makes one suspicious of its true age).

Twenty-five complete obelisk dials are known to exist at the present time and two more have been described but cannot now be found. Many fragments also exist, often re-mounted on new bases. According to Ross the oldest is the dial at Lochgoilhead, which bears the date 1626, but there are good reasons for doubting its authenticity. In style it has more in common with the dials made at the end of the century than with its supposed contemporary at Drummond Castle, whose date of 1630 can be confirmed from the Chamberlain accounts of the Earl of Perth (Mylne 1893). On the latter all the faces of the capital are plain whereas the Lochgoilhead example has sunken hollows on the corner faces, a feature which is shared by only two others: at Asknish, which is dated 1695, and at Leven, which is undated. The Lochgoilhead dial bears the initials SCC and DHM, believed to stand for Sir Colin Campbell of Ardkinglass and Dame Helen Maxwell. The Sir Colin who married Dame Helen did not succeed to the baronetcy until 1679 and although his grandfather of the same name was alive in 1626, he married Mary (or Margaret) Sempill. The date of the later Sir Colin's death is not known with certainty as the records for the period are missing, but his son James had evidently succeeded to the title by December 1696, when he married Margaret Campbell of Gargunnoch, so it is possible that Sir Colin died earlier in that year and the dial was erected in his memory. The carving of the figures is such that the '9' could readily have been altered to '2' at a later date by the addition of a tail, though the reasons for doing this are not obvious. Another significant point is that the initials DHM are cut



ILLUS 6 Partial obelisk dial, Auchenbowie, 1702 (Photo: K MacKay)

on the top section of the shaft, above the SCC, and that this section is of a different stone from the rest. On all other dials known to me which have initials, those of the husband appear above the wife's, or else side by side. Since Dame Helen died in 1709, it is possible that this piece was added later, to commemorate her death. Another possibility, which ignores the discrepancies of style, would be that the dial was erected by the earlier Sir Colin in 1626, and added to by his great-grandson, Sir James, in 1709 to commemorate his mother. On the whole I prefer to believe that the true date of the Lochgoilhead dial is 1696 and that the Drummond Castle dial is the first of the type as its style is unique and it was made by the great master mason John Mylne, who also created the unique facet-head dial at Holyrood for Charles I. Why no more obelisks were made, or at least can be dated, until 1692 is perhaps one of the mysteries of fashion, though John Mylne's grandson, Robert, had become master mason in 1668; might he have revived his grandfather's design as a response to changed fashion after the dismissal of the Stewarts in 1688?

The dial at Asknish was also erected by a member of the Campbell clan, Sir Duncan of Achnabreck and his wife Lady Henrietta Lindsay (Mackenna 1981), though there does not appear to be a direct connection between that family and the Ardkinglass branch. Margaret, sister of Sir James Campbell of Ardkinglass, married John Campbell of Otter, minister of Kilmodan and in 1719 they erected a fine obelisk dial which is now at Ormidale House. Sir James himself succeeded to his wife's estate of Gargunnoch and a horizontal dial in the garden there bears his name and the date 1731. So sundials seems to have been a favourite with the Campbells as family memorials and there is also a



ILLUS 7 Obelisk dial, Carberry Tower

tradition of making later additions to them: the Asknish dial has an inscription to McEver Campbell, who died in 1746, and the Otter dial has the initials of Mungo Nulter Campbell, 1830.

Most obelisk dials rest on a shallow flight of steps, but there is a group of five which stand on square plinths with representations of the sun, moon and a star (or three suns, in one case) on three sides. As they are scattered across the country it is not possible to say that they are characteristic of one locality or sculptor.

3 FACET-HEAD DIALS

This term covers a wide variety of types, from the simple cube to complex polyhedrals. The cubes usually have five dials, four on the vertical sides and a horizontal on top, and one such, at Troquhain in Kirkcudbrightshire, is said by Ross to be the oldest dated dial in Scotland. Recent inspection, however, has convinced me that its supposed date of 1616 is really 1676: the top bar of the '7' lies along the arris of the block and is slightly eroded but still unmistakable. It carries the initials W MG (possibly Gordons, who owned Troquhain in the 17th century, or M'Guffog, neighbouring landowners) and there is an almost identical dial at Kirkdale, not far away, with the same initials and

the clear date 1674. There are many dials with earlier dates than this: a stone horizontal at Farnell Castle, Angus, has the date 1513, though its engraving is so clear and unweathered as to make one dubious that it could be so early. An intriguing polyhedral dial at Fingask Castle, Perthshire, poses something of a problem. The Monuments Record describes it as having four rampant lions supporting a bell-capital and mermaid figure, while the OS *Name Book* for 1861 says, on the authority of Sir Patrick Murray Threipland, that it bears the date of 1563 and is said to have been in the gardens of Mary Queen of Scots at the Palace of Holyroodhouse. At the present time there is a structure at Fingask with rampant lions and a mermaid figure, but it does not appear to be a sundial and has no date; another structure nearby consists of an octagonal block on a pillar, with a horse's head finial, marked as a sundial with 11 faces and a worn date which could well be 1563 (illus 8).

The pillar has the monogram 'MR' (Maria Regina?) though this is obviously more recent, probably Victorian since its base has an inscription, only partly legible now, which appears to give the history of the dial. The horse's head is also of a different stone from the dial block but if the date of 1563 is correct, this is the oldest known polyhedral dial in Scotland.

The simple cubes may be decorated with carving: some are topped with cherubs' heads and one of these, at Ellon Castle, is said to commemorate the murder of the children of Baillie Gordon of Ellon by their tutor, Robert Irvine, in 1717. The story is in Chambers's *Traditions of Edinburgh* (1868 ed, 385) and the children were murdered because of reporting 'some liberties they saw him take with their mother's maid'. However there are four heads on the dial and only two children were killed; also, there are very similar dials at Forgue and Philorth House, so it may simply have been a local fashion at the time. Other cubes are elaborated with bowl-hollows and sloping dials above, like the one at Duthie Park, Aberdeen, which also has a spherical ball dial finial (painted black). There are also diamond shapes, balanced on a point, such as the dial from Inveresk Lodge, which is now at the Marling School, Stroud. An octagonal form is common and a particularly graceful example is at Lennoxlove, Haddington, brought from North Barr, Renfrewshire early this century. The dial at



ILLUS 8 Facet-head dial, Fingask Castle, detail showing square and compass and date, 1563



ILLUS 9 Facet-head dial, Glamis Castle (*Photo: G Higgs*)

Pitmedden Garden, Aberdeenshire, goes a stage further and has 24 facets, rather like the capital of an obelisk, but with a hollow dial in each facet and it acts as the focal point in the restored 17th-century garden. Sometimes copper dial plates are fitted to polyhedral dials (a good example is in Edinburgh City Museum, Huntly House) and sometimes the facetting becomes almost over-exuberant, as on the Glamis Castle dial (illus 9) where the pineapple-like structure has 80 facets and the supporting lions each carry a shield with a dial, making a total of 84 dials on a structure 7 m high. A number of other polyhedral forms has also been used, including several rhomboidal dodecahedra of which a fine modern (1950s) example is at Daldowie Crematorium, Baillieston, now replaced after having been stolen in 1986. Only one regular pentagonal dodecahedron has been reported in Scotland, at Waygateshaw, Lanarkshire, and this has now disappeared (another pentagonal dodecahedron is at Barrington Court, Somerset, and is said to have come from Scotland). One of Thomas Ross's reconstructions, at Linburn House, is in the form of a regular icosahedron, ie a prism faceted in 20 triangular faces, some of them with hollows. Unfortunately it has been repeatedly vandalised and is now in store but another dial at Linburn, probably also designed by him, a fine octahedral block mounted on a rococo plinth and with an elaborate obelisk finial, is still in excellent condition (illus 10). It is very similar in style to the pair of identical dials at Newbattle Abbey, erected in 1635 by Lord Lothian and copied in the 19th century by Lord Home and Lord Haddington. Lord Home's dial, originally at Douglas Castle, was moved to King's Park, Glasgow in about 1931. Lord Haddington's is



ILLUS 10 Composite dial, Linburn House

still at Tynninghame, but it was never finished and the panels which should be marked with dials are blank.

A few dials exist which show the time in a number of cities round the world. One such is at Nunraw Abbey, East Lothian, with dials for at least 22 cities, as well as local time (illus 11), and another is in Brechin, made at the beginning of this century by a local mason, James Tosh. Many others have marks to show the local time of noon in different cities, but not full dials for each one.

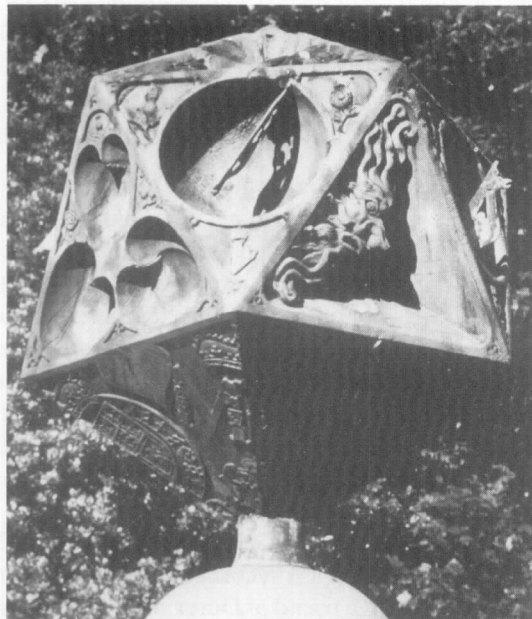
The finest dial of the facet-head class, however, must surely be the one at the palace of Holyroodhouse, made for the Scottish Coronation of Charles I in 1633 by his master mason, John Mylne. Except possibly for Fingask Castle, it is the earliest of the class and is the most intricately carved, one of the gnomons being in the form of a grotesque face with a pointed nose (illus 12). The Royal accounts show that it cost £408 15s 6d Scots plus further charges for painting and gilding (see Mylne 1893), this additional charge illustrating that at that time it was customary to paint these stone sculptures.

Concluding this descriptive section, a final oddity may be mentioned which combines features of all the types considered above. This is the dial at Mount Melville, outside St Andrews, now part of Craigtoun Hospital. The shaft carries sinkings like an obelisk, but is eight-sided; above it is a collar with inclined hemi-cylinders reminiscent of a lectern, topped by a large cube with heart-shaped and other hollows and finally a polyhedron with dials on each facet.

That ends our survey of the main types of free-standing dials to be found in Scotland and we now have to consider why there should have been this remarkable fashion for them in the 17th and early 18th centuries and whether the designs were native or came from abroad.



ILLUS 11 Facet-head dial, Nunraw Abbey



ILLUS 12 Facet-head dial, Palace of Holyroodhouse, 1633, detail

HISTORY

Scotland under the Stewarts was an unsettled country, caused, in part, by a series of long minorities. Constant warring between factions trying to gain control meant that houses had to be fortified and conditions were not favourable to new building until James VI began to reign in his own right towards the end of the 16th century. At this time too, money became available in the form of the revenues from the monasteries which had been destroyed at the Reformation and whose lands were given to the nobility. By the beginning of the 17th century therefore, the material conditions existed, in the form of stable government and sufficient cash, to enable the construction of more open mansion houses with pleasure gardens, as had been the fashion for some time in England and France. But, although necessary, these conditions were not sufficient to account for a fashion in sundials since the same conditions had existed in other countries since the early 16th century without such a fashion developing. Other factors must be sought.

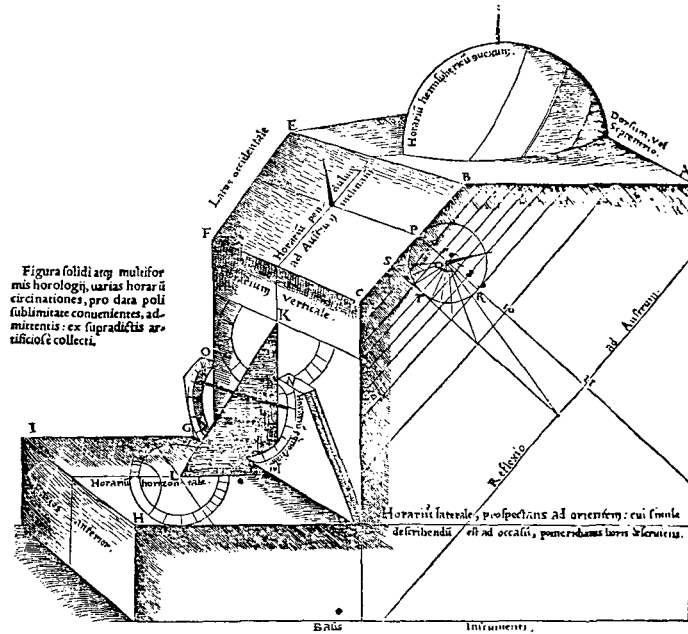
EARLY GARDENS

The Renaissance garden developed originally in Italy, from the late 15th century onwards, and spread to France and England in the 16th century (Strong 1979), but there are few records of free-standing sundials anywhere at that time. In fact the fashion for such garden dials never seems to have taken hold at all in Italy, where today there are very few: most dials in that country are of the wall-mounted variety (Azzarita 1985). At the beginning of the 16th century Francis I built the great French chateaux, but he does not seem to have been interested in gardening (Strong 1979, 31) and no garden sundials are known to have been associated with them. Those which exist in France today are mostly much later: M René Rohr has documented a number in Alsace (Rohr 1971), but very few date from before 1700. At the same time, Henry VIII in England was spending freely on improvements to the gardens at Hampton Court and Whitehall and on a new palace at Nonsuch. His account books mention the purchase of seven sundials for the Privy Orchard in 1531 and no less than 20 for the Privy Garden in 1534, but these were described as 'brazen' and it seems likely that they were ordinary horizontals since they cost only 4/4d each (Hunt 1974, 132). Strong comments, however (1979, 28),

here we are at the fount of what continues to be a standard garden feature . . . in embryo we have already the idea that the garden is an area for the demonstration of the sciences

It could be argued that at this date the knowledge of polyhedral sundials was not widespread as the first printed books describing them did not appear until the 1530s. Sebastian Münster and Albrecht Dürer in Germany and Oronce Finé in France published works within a few years of each other which reproduced almost identical diagrams (illus 13), probably copied from the 15th-century manuscripts of Regiomontanus and his teacher, George of Peuerbach. These are likely to have been intended as demonstrations for mathematical students rather than as practical construction guides and all sundials showing equal hours, which can be dated before 1520, are of the wall-mounted or horizontal varieties (some polyhedral dials are known from classical times, but these are of the more primitive 'unequal hours' type, based on the division of daylight into 12 equal parts, regardless of the time of year (Gibbs 1976)). These diagrams do not show the sinkings and hollow dials which are so characteristic of the Scottish structures.

In 1517, however, the German mathematician Nicolaus Kratzer had arrived at the court of Henry VIII and by 1519 it is recorded that he was 'astronomer and deviser of the King's horologes' (North 1978). He was a friend of Dürer, who made a drawing of him, and of Holbein, who painted his portrait showing him with his instruments in the act of constructing a polyhedral dial (illus 14). He is known to have made two stone polyhedral dials for Oxford in the 1520s (Pattenden 1979) but these



ILLUS 13 Illustration of a polyhedral dial, from *Oronce Finé*, 1532



ILLUS 14 *Nicholas Kratzer*, after Holbein, 1528 (Photo: National Portrait Gallery)

had disappeared by the 18th century so that, until very recently, the only known example of his work was a portable metal dial made for Cardinal Wolsey and now in the Museum of the History of Science in Oxford. In 1985, however, a stone cube dial, with one sloping edge, was discovered in the undergrowth around the derelict Iron Acton Court, near Bristol, now under restoration by English Heritage. It bears the date 1520 and the initials NK and since the house was owned at that time by the Poyntz family, who were prominent courtiers of Henry VIII, it seems highly likely that Kratzer made the dial for them (White 1986). He may have designed another in the Great Garden of Whitehall, which was described by a traveller in 1585: 'in the middle of the garden is a nice fountain with a remarkable sundial, showing the time in 30 different ways', and again in Jacobean times by the young Duke of Saxony:

in the middle of the garden is a great quadrangular stone, hollow in the middle and round like a baptismal font. One walks up four steps. On this stone are over 117 sun-circles, on which you can see the hours . . . this Horologia was designed in the first place in Henry VIII's time by Joan Pieneto Episcopo Wintoniensi but was later restored by the present King [James I] as the inscription records (Strong 1979, 34–5).

This may well be the dial rebuilt by Gunter in 1622 (Gunter 1624, who describes in detail how the stone was painted) which was destroyed later in the century by a drunken nobleman (Gatty 1900). Strong doubts the attribution to the Bishop of Winchester, who at that time was Stephen Gardiner, not Joan Pieneto, and suggests that it was more probably the work of Kratzer.

Despite Kratzer's early example, however, the fashion for these complex, free-standing dials does not seem to have caught on in England at this time and another testimony to their scarcity comes in a letter from the noted mathematician, Thomas Digges, to Lord Burghley in 1574, in which he mentions that he is making

a regular body platonicall, garnished with solar dials, sutch as I think hitherto in this land hath not been seen. . . . (Halliwell 1841).

Today there are few such dials surviving in England compared with the numbers in Scotland; one, at Marrington Hall in Shropshire, is dated 1595, and there are others at Madeley Court, Shropshire, and Elmley Castle, Worcestershire, which are also believed to be 16th-century, as well as some splendid 17th-century dials such as those at Badminton House, Moccas Court and Upton Manor. It seems likely that in the 16th century there was insufficient interest in science for this type of dial to be popular. This applies in Scotland as well as in England and France: despite the generally unfavourable conditions for building throughout the 16th century, James V had a brief period of extravagance in the 1530s when he built Renaissance-style palaces at Falkland and Stirling and employed a Frenchman to create gardens there. Hynd (1984) makes the interesting suggestion that in the late 16th century the swings of power meant that the nobility often had to retreat to their country houses and devote themselves to gardening and he traces a number of castles whose gardens were created then; yet at this time there seem to be few records of sundials. By the end of the century interest in mathematics and astronomy had increased greatly owing partly to the need for improved instruments for deep-sea navigation and in the 17th century the Crowns were united under James VI & I, who had the Whitehall dials restored in 1622. Charles I commissioned the Holyrood dial in 1633 and is reputed to have carried a ring dial which he gave to his attendant the night before his execution (though this may have been a form of circular slide rule (Waters 1978, 478–9)). By the time of Charles II we are in the great period of scientific discovery, with the foundation of the Royal Society and the perfection of the pendulum clock, which eventually eliminated the need for the sundial as a regulator of clocks. The dial was by no means finished after that. It took on a new lease of life as an educational tool by adding more astronomical information, such as the declination of the sun, its position in the

heavens, the equation of time and so on, when it was no doubt used as a 'conversation piece' by the owner and his guests. So, in addition to peace and finance, another vital element for the development of the complex sundial was an interest in science.

17TH-CENTURY GARDENS

If we now look further at the development of the garden in the 17th century we find, paradoxically, that just as the French influence in Scotland was declining following the Reformation and the ending of the 'Auld Alliance', it was coming into England in the person of a French hydraulic engineer, Salomon de Caus, who, with his brother Isaac, was an expert on water gardens, which they built at several of the Royal palaces. As well as fountains, cascades and grottoes, these had working tableaux, usually illustrating classical legends, in which moving figures were operated by hydraulic power. This type of garden originated in Spain and Italy, where the hot, sunny climate set a premium on water for coolness and where flowers were less important. Statues were also a feature which was popularized in England about this time by Inigo Jones, on his return from a trip to Italy with the Earl of Arundel.

Symbolic gardens were also made, in which plants and stones were chosen for their magical associations with the heavenly body whose influence it was desired to attract. It has been said that it was not until Restoration times and the influence of John Evelyn, horticulturist as well as diarist, that plants were grown and studied for their own sakes rather than for their herbal or magical properties (Strong 1979, 221). Such gardens may have persisted longer in Scotland than in England and the significance of this will become apparent later when the symbolism of the dials is discussed. Although a Venetian traveller quoted by Strong (1979, 115) does remark on the sundial as one of the standard features of the English garden, evidence of their existence, or their form, is scarce, perhaps because many of these Renaissance gardens were either destroyed in the Civil Wars or else swept away in the gardening revolution of the next century, when the present concept of the English landscape garden was created. Maybe a lot of sundials were lost then, though the comment has been made that the sundial was often the only thing which survived the revolution.

DUTCH INFLUENCE IN SCOTLAND

In Scotland, however, things took a rather different turn. Ever since the death of Mary of Guise and the Reformation in 1560, French influence had been declining and trade with Holland had increased. The Dutch universities were renowned at this time and much favoured by the Protestant nobility for the education of their sons, and there was a considerable permanent population of Scots in The Netherlands. So French influence was now being replaced by Dutch and also the country was rapidly becoming Calvinist, with the Calvinist distrust of decoration for its own sake. Anything decorative had to have at least a nominal function, preferably educational, and perhaps sundials were favoured because they served both these purposes. Perhaps also the plentiful supply of water in Scotland made it less of a novelty than in the hotter climates of Italy and France. The southern fashion was not entirely ignored: the lectern dial at Dundas Castle (illus 15), built in 1623 and the earliest of its type, as well as one of the most elaborate, is mounted on top of a fountain which was part of a Renaissance water garden made by Sir Walter Dundas, but this type of garden architecture did not become common in Scotland until the 18th century, by which time the sundial fashion was declining. The first significant encounter of the Scots with the Low Countries style of architecture may have been as early as 1589, when James VI went to Norway and Denmark to marry Anne of Denmark and must have seen some of the Dutch-built Royal Works there, and in 1615–17 this new fashion made its appearance in Scotland (Hay 1984), just before the first of the sundials. So, did the Dutch have an influence on sundial design and were specimens perhaps imported from there and used as models?



ILLUS 15 Lectern dial, Dundas Castle, 1623

DUTCH SUNDIALS

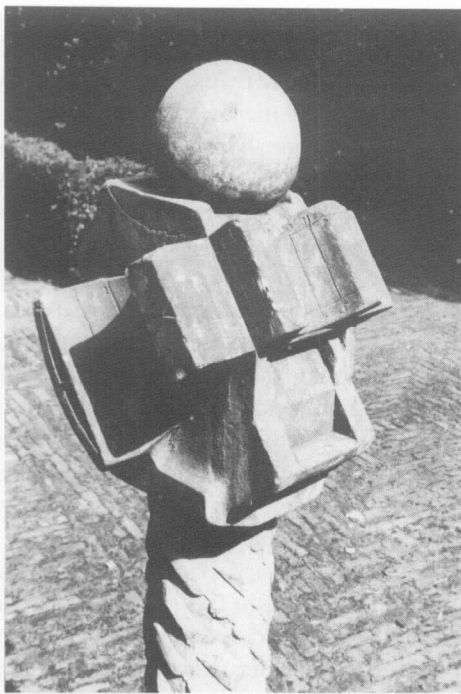
The Netherlands has no good stone suitable for sculpture. Most of its carved stonework comes from an outcrop of fine-grained sandstone just across the German border at Gildehaus, where quarries have been worked since the 14th century at least and are still worked today (Neumann 1977). Carvings and sculpture, including sundials, have been exported from here to Holland, Northern Germany and as far as Denmark for a long time. There are still numbers of polyhedral dials in the area with features in common with the Scottish dials, but my impression is that the overall style is quite different: a number of examples exists with a star and a multi-faceted block, such as the one at Echten, but the star is separated from the block in a way not found in Scotland. Others, such as the one at Apelern near Hanover (illus 16), have more resemblance to the Scottish lecterns, but the style is unmistakably different and in any case they are considerably later. A catalogue of Dutch sundials (Van Cittert-Eymers & Hagen 1984) lists 523 of all types of which 71 are polygons, but only two of these can be dated before 1700. One of them is the earliest complex dial I have found anywhere, at the Huis van Loon in Amsterdam (illus 17), dated 1578. It even has a sophisticated feature for marking the declination of the sun which, together with the decorated pillar, would suggest a much later period, though the date is very clear. But after that there is no other dated polygon until 1700 and that is a regular dodecahedron; the next lectern does not appear until 1750.

OTHER CONTINENTAL DIALS

Another country which has produced a useful catalogue of its sundials is East Germany (Zenkert 1984), but here again, out of a total of over 1000 of all sorts, there are only 49 *kombinierte*



ILLUS 16 Lectern dial, Apelern, West Germany, 1755



ILLUS 17 Lectern dial, Huis van Loon, Amsterdam, 1578 (Photo: M J Hagen)

(ie multiple) dials listed and most of these date from mid to late 18th century. A similar catalogue from Hungary, including countries formerly in the Austro-Hungarian Empire, lists 321 dials (Keszthelyi 1983). Full descriptions are not always given, but there seem to be few which are not of the usual horizontal and vertical types and fewer still earlier than the mid 18th century. Zinner's (1964) great compendium of some 5000 European sundials unfortunately includes only dials attached to buildings. A recent book on the stone sundials of Galicia (Basanta 1986) lists 305 dials, but no free-standing polyhedral dials at all, and in the rest of Spain I have only found mention of one, near Malaga. In Italy also I only know of one and in France there are very few.

In Scotland, on the other hand, I have listed 267 free-standing polyhedral dials, of which at least 47 can be dated before 1700 and this takes no account of many others which, from their style, are of the same period but have no dates. On these grounds I think it unlikely that the Scottish multiple dials were derived from continental models, either in The Netherlands or elsewhere: it seems certain that they were a peculiarly Scottish fashion and that some of the types, notably the obelisk, are unique to Scotland.

SYMBOLISM

Large wall or horizontal dials, accurate to a minute or two, were commonly used to regulate the erratic mechanical clocks of the day and polyhedral dials would not have been as convenient for this purpose. It seems highly improbable, therefore, that the multiple dials were made primarily as time-keepers; their faces were too small for accuracy and they were often mounted where they would have been difficult to read. Also, as has been explained earlier, the mathematics involved in setting them

up were not exceptional, so they were not likely to have been made as mathematical *tours de force*. As an example of what could be done in this direction we may take the great horizontal dial at Drumlanrig Castle, made by the London clockmaker Henry Wynne in 1692, but based on a principle devised by the mathematician William Oughtred in the 1620s. This is a 'double horizontal' dial ie two independent dials in one, which can be used as a ready reckoner to find the meridian, the position of the sun in the heavens, the date, sign of the zodiac and other astronomical parameters as well as the time. It also has 15 separate rings for use as a moon-dial and noon marks for many cities around the world. The multiple dials do not approach this in sophistication although the knowledge was available throughout the 17th century.

The special feature of the multiple dials lies, I suggest, in their symbolic design and in their very multiplicity, which serves to reinforce the symbolic message. To appreciate this, we have to consider the intellectual climate of the 16th and 17th centuries. Renaissance men were looking for some form of universal religion which could heal the splits in the Church and result in a Brotherhood of Man. Many believed they had found the basis for this in the writings of the Egyptian philosopher Hermes Trismegistus, who was thought to have lived in the time of Moses and to have anticipated Christianity in many ways. Greek manuscripts containing these writings were re-discovered and translated in the 15th century and became something of a cult, along with other esoteric writings, of the mystic philosophers and the Rosicrucians. Although it was shown in the early 17th century that the supposed writings of Hermes were in fact post-Christian and not Egyptian at all, many adherents of the cult refused to accept this and continued to advocate them for much longer (Yates 1964; 1972). It was widely believed that the masonic lodges were the guardians of much of this esoteric knowledge and in the 17th century many intellectuals seem to have joined the masons in the hope of enlightenment. The early history of freemasonry is still controversial, especially over the question of these 'non-operative' members: were they really 'speculative' masons in the modern sense of being interested mainly in the ritual and secret society aspects or were they merely honorary members elected because of their influence or interest in building? Nevertheless there is agreement that the records of the Scottish lodges go back further than anything in England, in fact to the 16th century, and that many non-operatives joined them in the century following, for whatever reason. In his forthcoming book, *The Origins of Freemasonry*, Dr David Stevenson traces the origins of the movement to this period in Scotland (though other authors do not agree and even deny that 'speculative' masonry grew from the operative lodges at all, see eg Hamill 1986). The earliest recorded of these non-operatives was Sir Robert Moray, soldier, diplomat, alchemist and one of the founders of the Royal Society, who was admitted to the Lodge of Edinburgh in 1641; Dr Stevenson has published a study of him which gives us a good insight into the intellectual atmosphere of the time (Stevenson 1984).

Moray made considerable use of masonic seals and expounded their meaning in his letters. One of the symbols he employed was the compass with its needle pointing to a star (*ibid*, 421), which also occurs in symbol books of the time with various meanings: constancy towards God, or the Virgin Mary ('Stella Maris') or, often in association with a heart, a loved one. The influence of the stars on our fate is another possible interpretation. In form this symbol is virtually identical to the bowl-hollow with a bar gnomon across its diameter, found on the east or west sides of many dials (see for example *illus* 12, Holyrood, or Pitmedden; in other dials the gnomon is cut in the stone and stretches across the full diameter). When one remembers that it is an essential requirement of the polyhedral dial that all the gnomons point to the Pole Star, the parallel is evident and the multiplicity of gnomons reinforces the message. It is tempting also to speculate that the single direction of the gnomons, despite the varied orientation of the dial faces, may have been intended to symbolize the constant element of faith common to all sects. Wither (1634) illustrates a quadrant sighted on a star, commenting that the stars are subject to God and are here

to helpe, not hinder us, in God's command. And hee not only rules them by his pow'rs but, makes their Glory servant unto ours.

Praz (1947) quotes from a symbol book of 1574 a figure of Love holding a quadrant in his hand and gazing at a lady, while nearby the needle of a compass points to a lodestar in the sky: 'so in the storm of love, thy shining eyes are my sole guide and comfort!' Other instances are given of the compass needle being used in connection with the 'Ave Maris Stella' cult of the Virgin Mary.

Hearts are among the commonest markings on these dials, as they are in contemporary symbol books, again with a variety of meanings, but usually associated with love: the mystics, who described various 'Ways' of achieving re-birth, or 'Renaissance', used the heart for the 'Way of Love' (Bayley 1912, ch III), while, on a lower plane, it was used by lovers to signify constancy to their mistresses, as on today's Valentine cards.

Many dials have initials, coats-of-arms and dates on them and were obviously built as family memorials where symbols of love and constancy would have been appropriate, while others may have been intended to have religious significance.

The globe is a common feature of facet-head and, occasionally, obelisk dials, often marked with hour lines and the signs of the zodiac. According to Bayley (1912) it was the most frequent symbol of the Egyptian Gods:

emblem of creative motion, being in fact the wheel of the Spirit of Life – the whole system of the Universe from the planet to its ultimate particle revolving in the same manner.

The characteristic pyramid of the obelisk finial, also used as an ornamental feature on buildings and gate-posts, is a symbol of great antiquity; according to Wither (1634), the pyramid 'stands fast and shewes alike on every side', being used as a symbol of strength and constancy. Bayley (1912) says that

the number eight . . . has from most ancient times been the symbol of regeneration . . . and the octagonal form of Christian fonts is said to have arisen from this symbolic cause.

Many sundials, of course, also have an octagonal form, with vertical dials on each side; even table dials are often cut as an octagon.

The star on the lectern dials is almost always eight-pointed, but the star on the 'sun-moon-star' obelisk plinths (Burrell, Kelburn 2 and Ormidale) is the five-pointed pentacle used as a mason's mark by Sir Robert Moray and interpreted by him in many ways (Stevenson 1984). The sun, moon and five-pointed star were used as symbols of the Hermetic Trinity of Mens, Intellectus and Amor (Yates 1964) and also appear frequently on masonic articles, though they are not exclusively masonic symbols. The mason's square and compass are not generally seen on sundials except where they are associated with masonic temples, though they appear, albeit in a different form, on the very early dial at Fingask (illus 8).

The accumulation of evidence of this sort, although circumstantial, leaves little doubt that these dials had a much greater significance for their 17th-century owners than the mere telling of time. It seems likely to me that the contacts between intellectuals and working craftsmen in the masonic lodges could have stimulated the fashion in symbolic dials, which were expensive items to make and required the patronage of the rich as well as the talents of the artisan. Which of the two actually provided the designs is a debatable point. There can be no doubt that masons at the top of their profession were capable of designing as well as executing the work: John Mylne and his sons for example, almost certainly designed the dials at the Palace of Holyroodhouse and Drummond Castle as well as working on them with their own hands (Mylne, incidentally, was master of the masonic lodge of Scone as his father and grandfather had been before him, going back to about 1550), but it was also customary at the time for gentlemen to design their own houses and supervise the building themselves and the same may well have applied to the sundials. The parts played by gentleman

amateurs and professional masons as architects in the 17th century are discussed and documented at length by MacGibbon and Ross (1892, V5, 515), and it is clear that there were no sharp demarcation lines at that time. They also show that it was usual to specify features such as windows, gateways etc. to be copied from existing buildings and one can easily imagine this to be the case with sundials, especially the lecterns and obelisks, which are virtually identical, within each class, in overall shape and differ only in details which could have been supplied by the individual craftsman. In this case the symbolic motive may not have been uppermost in the mind of the owner but it was certainly at the root of the fashion and the meeting house provided by the masonic lodges may well have contributed to its evolution.

CONCLUSIONS

We have seen that Scotland today has a greater recorded number of complex 17th- and 18th-century sundials than other countries. Although many have undoubtedly been lost and it may be dangerous to argue from those that still exist, it seems a fair assumption that this has always been so. They became popular at a time when conditions were right for new construction and when Renaissance ideas on building and garden design were at their height, but also when the intellectual climate favoured the study of science and the prevailing Calvinist ethic despised decoration for its own sake and required function as well. As to the origin of the designs, we know that the earliest manuscripts and printed books describing polyhedral dials came from Germany and circulated rapidly in other countries; Sebastian Münster's book of 1531 was in the library of the Abbot of Kinloss by the mid 16th century (Durkan 1953, 20). But each country seems to have taken only the basic principles from these books and to have developed its own characteristic style. Although the theory of drawing dials on surfaces facing any direction was well established in the 16th century, the early German diagrams do not show the lectern and obelisk shapes or hollow carvings which appear to be a characteristic introduction of 17th-century Scotland. Many of the earliest dial-makers were Scots such as John Mylne, his sons and other master masons of the time whose names are known (MacGibbon & Ross 1892, 515) and although foreign craftsmen were commonly employed in Scotland, at least from the time of James V onwards, I have not found records of any of them having made dials, or of dials having been imported (eg from Veere, which was the Scottish staple port in The Netherlands, and where the 'Scots House' still survives as a museum containing records of trade). At Kinross House Sir William Bruce employed Dutch stone-carvers, but his sundials were cut by John Hamilton, a Scottish mason (*ibid*, 566). The obelisk design appears unique to Scotland and the lecterns are earlier than similar dials elsewhere, so it would seem virtually certain that these are truly Scottish creations which owe little, if anything, to foreign influence. But perhaps the most important factors contributing to the design and popularity of these dials may have been the Hermetic cult of symbolism and the emergence of speculative freemasonry as a medium for introducing working masons to symbolic ideas. Despite what has been said earlier about the increased interest in science, the 17th century was a time of transition in thought, when magic, alchemy and symbolism were still of great importance. This is a large subject and beyond the scope of the present article, but the coincidence of a unique freemasonry and unique sundials in 17th-century Scotland is surely too great to be accidental.

Why the dials should have disappeared so abruptly by the middle of the 18th century is another matter. Fashions change inexplicably of course. Although the first obelisk dial dates from 1630, this type did not become popular until the end of the century; lecterns predominated until 1684 when the last to be dated was made. Obelisks then proliferated briefly in the early 18th century, but the last of these is dated no later than 1731. By that time of course, the next garden revolution was taking place, and also Scotland was in the run-up to the Industrial Revolution, with all the change in outlook that

implies, including a shift from magic to science, and it is likely that those with money to spend on such things would prefer something mechanical, such as the elaborate clocks then becoming available, with astronomical, tidal and equation dials etc.

On the continent, on the other hand, mid 18th century was precisely the time when the elaborate dial reached its peak, but although the plinths and the dials themselves often have ornate baroque and rococo decoration such as is rarely seen in Scotland, they do not seem to have made extensive use of the more symbolic patterns. Most of those surviving on the continent belong to this period. Perhaps it was because the Industrial Revolution started later there and the patronage of the *ancien régime* lasted longer? Could it also reflect the later development of freemasonry?

In Victorian and Edwardian times the Romantic movement popularized sundials once again and associated them with 'improving' mottoes, which had not be a common feature in earlier days. The emphasis of books from this period, such as the first edition of Gatty in 1872, Henslow (1914) and Cross (1914), tends to be on the mottoes rather than the dials themselves, but some fine dials were made in the old style by architects such as Ross and Lorimer, to match their restorations of old houses and gardens.

THE CATALOGUE: SUMMARIES

I have endeavoured to list all the free-standing polyhedral dials which have been recorded. Dials attached to buildings and ordinary horizontal table dials are not included, except for a few of special interest in the 'Miscellaneous' section. My starting point has been the survey of MacGibbon and Ross (1892) and I have followed their classification; since then I have found only two extensive papers, those by W B Stevenson (1940) and A N Robertson (1949) though there are a number of shorter references scattered through local historical and archaeological journals. The other main sources have been the inventories of the Royal Commission on Ancient and Historical Monuments, Scotland and the unpublished files of the National Monuments Record of Scotland. Wherever possible I have visited the sites personally to check the continued existence of the dials and have tried to trace those that were missing. In the course of this work I have come across a number of others which had not previously been recorded.

Summaries by county and type follow and the main listing, which is arranged by place or house name, is on microfiche (fiche 3:A4). A list of 'missing' dials is on fiche 3:G12 and details of sundial study groups on the continent is on fiche 3:G14.

For full entry, refer to the main listing on microfiche, which is arranged by type and alphabetically by place or house name as given below (fiche 3: A2-G14)

Notes: () Moved to another site
 * Missing
 † Not yet investigated

A DIALS ARRANGED BY COUNTY

Aberdeenshire

Lectern: Castle Fraser.

Facet: Duthie Park, Ellon Castle (1, 2), Forgue, Grandhome, Haddo House, Kildrummy Gardens, Logie House (1, 2)*, Midmar Castle, Philorth House, Pitmedden, Pittodrie House, (Rubislaw Den), Schivas House, Turner Hall*, Williamston.

Misc: Aberdeen (1, 2, 3), Crathes Castle, Dunecht House.

Angus

Obelisk: Brechin Castle, (Panmure House).

Lectern: Balnamoon, Gray House*.

Facet: Brechin, Brighton, Glamis Castle, Guthrie Castle, Kinnaird Castle, Lour.

Misc: Auchterhouse, Farnell Castle, Idvies House, Pitscandly House (1, 2).

Argyll

Obelisk: Ardlamont House, Asknish House, Lochgoilhead, Ormidale House, (Otter).
Facet: Dalnaheish, Finnart House†, Quinish House.

Ayrshire

Obelisk: Grange Hill, Kelburn Castle (1, 2), (Kilwinning Abbey), Kirkside Place (1), Kirkton Hall, Ladyland (2).
Lectern: Ayr, Culzean Castle, Dumfries House, Ladyland (1), (Lainshaw), Loudoun Castle (1*, 2), Montgreenan*, Symington*.
Facet: Altamont*, Ardrossan, Ballochmyle House*, Cumnock, Doonholm, (Kirkhall), Kirkside Place (2, 3), Monk Castle*, (Montgomerie House), Redheugh*, (Silverwell House), Sorn Castle.
Misc: Coodham House*, Kilkerran†.

Banffshire

Misc: Mortlach Church.

Berwickshire

Obelisk: (Hutton Castle).
Facet: Coldingham, Dryburgh Abbey*, Duns, Swinton.
Misc: Cockburnspath.

Bute

Obelisk: Mount Stuart.
Lectern: Brodick.
Misc: Millport.

Dumfriesshire

Lectern: Dumfries Museum.
Facet: Annan†, Comlongan Castle, Dumfries, Ericstane*, Langholm (1, 2), Lochmaben.
Misc: Drumlanrig Castle (1, 2).

Dunbartonshire

Obelisk: Cumbernauld House, Rossdhu.
Lectern: Drums†, Garscube House*.
Facet: Gartshore, Meiklehill†.

East Lothian

Lectern: Ruchlaw*.
Facet: Drummorie House†, Dunglass, Haddington (1, 2*), Inveresk Gate*, Inveresk House (1*, 2), (Inveresk Lodge), Lennoxlove, Lochend House†, Nisbet Farm (1, 2)*, Nunraw, Pencaitland W, Prestonpans (1, 2)†, Tynninghame.
Misc: Inveresk Church, Luffness House (1, 2), Oldhamstocks, Prestonpans.

Edinburgh

Obelisk: (Meggatland).
Lectern: Lauriston Castle, Royal Museum of Scotland (1, 2, 3), Saughtonhall, (Wrychtis Houses), Zoological Gardens*.
Facet: Belmont House, (Craiglockhart House), Edmonstone House*, Fettes College, (Grange House), Holyroodhouse, Huntly House, Inch House (1, 2)*, Inverleith Terr, (Minto House), Portobello, Ravelston House, (Warriston House).
Misc: Hudson Cottage.

Fife

Obelisk: Leven, Wemyss Castle.

Lectern: Fordel, (Pitreavie), Scotsraig, Wemyss Castle.

Facet: Aberdour Castle (1), Balbirnie, (Balgonie Castle), Balmungo House†, Comely Park House†, Craigtoun Hospital, Dunino†, Earlshall, Glassmount†, Inverkeithing, Kenly Green†, Kirkforthar, Leucharst†, Melville House*, (Mount Melville), St Mary's College.

Misc: Aberdour Castle (2), Aberdour House, Elie, Kellie Castle (1, 2), Torryburn†.

Glasgow

Obelisk: Burrell Collection.

Facet: Kelvingrove Museum, King's Park, Woodend*.

Misc: Polmadie†.

Inverness-shire

Lectern: Balloan House, (Cantray), Dunvegan Castle.

Facet: Invergarry House.

Kincardineshire

Facet: Fettercairn, Kingcausie House, Stonehaven.

Kinross-shire

Misc: Kinross House†.

Kirkcudbrightshire.

Lectern: Hensol House, (Kenmure Castle), Kirkcudbright Museum.

Facet: Bargaly House, Kirkcudbright/Hornell Museum, Kirkdale, Meadowbank, Troquhain.

Misc: The Cleugh (1, 2), Kirkbean, Kirkcudbright/Hornell Museum, Lairdmanoch House, Minigaff†.

Lanarkshire

Lectern: (Hamilton Palace).

Facet: Bredisholm*, (Cadder House), Craignethan Castle*, Daldowie Crematorium, (Douglas Castle), (Douglas Support), Johnston Hall*, (Lauchope House), Lee Castle, (Robroyston House), Rutherglen Museum (1, 2), Torrance House†, Waygateshaw*.

Midlothian

Obelisk: (Barnton House), Bonnington House, Carberry Tower (1), Pinkie House (1).

Lectern: (Calder House), Dundas Castle, Inveresk Lodge, Newbattle Abbey (2*), (Woodhouselee).

Facet: (Barnton House), Bonaly Tower, Cammo House, Carberry Tower (2) Linburn (1, 2), Newbattle Abbey (1), Newhall (1), Oxenfoord, Pinkie House (2), (Polton), Temple*, Wardie Garage*, (Woodhall).

Misc: Charlesfield†, Monkton Gardens, Newhall (2), Oxenfoord, W Pilton Farm†, Pinkie House (3), Rosslyn Chapel.

Moray

Lectern: Brodie Castle.

Facet: Elgin, Nairn.

Peeblesshire

Lectern: Lamancha House, Neidpath Castle.

Facet: Birkinshaw, Chambers Institute, Leithen Lodge, Peebles, Rutherford*, Traquair House.

Perthshire

Obelisk: Cardross, Drummond Castle, Gartmore, Gask House (1), (Invermay), Lawton, Leny House.

Facet: Abercairny, Ardblair Castle (1, 2), Arthurstone House (1, 2), Balhousie†, Cargill Manse†, Dollerie, Fingask Castle (1, 2, 3), Forteviot Manse†, Gask House (2, 3), Glencarse House, Glenearn, Greyfriars, Invermay*, Keir House (1, 2), Keithick House, (Muirton House), Over Benchie†, Rhynd†, (Springland House), Stobhall (1, 2†).

Misc: Erlston House (1, 2)†, Keir House (3), Leny House.

Renfrewshire

Obelisk: Pollok Castle†.

Lectern: Ardgowan*, Barochan, (Cartsburn House), Greenbank House.

Facet: Ardgowan, (Brediland House), Houston, Meiklerigg House†, (North Barr).

Ross & Cromarty

Lectern: Cromarty†, Foulis Castle.

Roxburghshire

Facet: Bemersyde, Kirk Yetholm†, Melrose.

Misc: Newstead, Prince Charlie's House.

Selkirkshire

Lectern: The Haining*.

Facet: Bowland, Fairmile*, Galashiels.

Stirlingshire

Obelisk: Auchenbowie House, (Auchincloch), Ballencleroch*, Ballindalloch, Callendar House (1, 2)*, Carron Grange*, Drumquhassle, (Gartness Castle), Kirkhill, Leckie (New) House, (Lennox Castle), Orchard Farm*, (Quarrell), Sauchieburn (1), Stirling Castle.

Facet: Airth, Airth Castle*, Callendar House*, Carronvale*, Chartershall†, Howkerse, Kin-naird House*, Pirnie Hall*, Powis House†, Sauchieburn (2), (Stenhouse), Watson House.

Misc: Gargunnoch House, Leddrie Green†, Torrance.

Sutherland

Obelisk: Tongue.

Lectern: Skibo Castle.

West Lothian

Obelisk: Barnbogle Castle, Craigiehall, Dalmeny House, (Livingston).

Lectern: New Liston.

Facet: Craigton, Cramond House*, Cramond/White House, Prestonfield House.

Wigtownshire

Lectern: (Whithorn).

Facet: (Castle Wigg), Loch Inch, Wigtown.

Misc: Loch Inch.

England

Facet: Darras Hall (from Carberry), Stroud (from Inveresk Lodge).

Ireland

Lectern: Bangor (by John Bonar of Ayr).

B DIALS ARRANGED BY TYPE

I Obelisks

Abbreviations used in the main listing:

B	Standard boss: octagonal band in middle with hollows on cardinal faces; all corners cut away; dials on all faces.
Bch	Boss with corner hollows; cardinal faces plain.
C	Complete.
F3(6)	Tapering finial with 3(6) panels.
nh	No hollows on boss.
P	Partial.
p	'Pointed' boss: upper and lower facets meet at a point on the NE, NW, SE, SW corners.
S4(5)	Square shaft with 4(5) panels.
SMS	Shaft stands on a raised plinth with sun, moon and a star on three sides.
w	'Wedge' boss: central band missing or rudimentary; upper and lower facets meet in a wedge shape.

Complete dials

25+2*	Ardlamont, Asknish, Ballencleroch*, Ballindalloch, Barnbogle, Bonnington, Burrell, Carberry (1), Carron Grange*, Craigiehall, Cumbernauld, Drummond, Gartmore, Kelburn (1), Kelburn (2), Kirkside Place, Kirkton Hall, Leny House, Leven, Lochgoilhead, Mount Stuart, Ormidale, Pinkie (1), Rossdhu, Sauchieburn (1), Tongue, Wemyss.
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Partial dials

12+4†*	Auchenbowie, Brechin, Callendar House (1, 2)*, Cardross, Dalmeny House, Drumquhassle, Gask House (1), Grange Hill, Kirkhill, Ladyland (2), Lawton, Leckie, Orchard Farm*, Pollok†, Stirling Castle.
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Standard boss

14+3*	Ardlamont, Auchenbowie, Ballencleroch*, Barnbogle, Bonnington, Burrell, Carron Grange*, Craigiehall, Grange Hill*, Kelburn (1, 2), Kirkside Place, Lawton, Mount Stuart, Ormidale, Pinkie (1), Tongue.
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Corner hollows

3	Asknish, Leven, Lochgoilhead.
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No hollows

6	Cumbernauld, Drummond, Gask House (1), Leny House, Rossdhu, Sauchieburn (1).
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Pointed boss

4	Cardross, Drumquhassle, Gartmore, Kirkton Hall (and cf Monaghan, Ireland, and Burford Priory dial in Oxford Museum of the History of Science).
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Wedge boss

3	Ballindalloch, Leckie, Wemyss.
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SMS plinth

4+2*	Burrell, Carron Grange*, Grange Hill?*, Kelburn (2), Mount Stuart, Ormidale.
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Boss with hollows on proclining surfaces only

Ladyland (2).

Boss with upper corners only cut out

Dalmeny.

Dated obelisks, by type

1630	Drummond	nh
1692	Sauchieburn (1)	nh
1695	Asknish	Bch
1696?	Lochgoilhead	Bch
1702	Auchenbowie	B
1707	Kelburn (1)	B
1714	Tongue	B
1716	Carron Grange*	B, SMS
1717	Kirkton Hall	p
1719	Ormidale	B, SMS
1721/31	Cumbérnauld	nh

Complete dials not dated

Ardlamont	B
Ballencleroch*	B
Ballindalloch	w
Barnbogle	B
Bonnington House	B
Burrell	B, SMS
Carberry (1)	
Craigiehall	B
Gartmore	p
Kelburn (2)	B, SMS
Kirkside Place	B
Leny House	nh
Leven	Bch
Mount Stuart	B, SMS
Pinkie (1)	B
Rossdhu	nh
Wemyss	w

II Lecterns

Abbreviations used in the main listing:

Star	Desk with star
NS	Desk without star
EQ	Equatorial
HC	Hemi-cylinder.

With star

15+4* Ardgowan*, Brodick, Culzean, Dundas Castle, Dunvegan Castle, Fordell, Garscube House*, Gray House*, Hensol House, Inveresk Lodge, Ladyland House, Lauriston Castle, Loudoun Castle (2), Neidpath Castle, New Liston, Ruchlaw*, Saughtonhall, Wemyss, Woodhouselee.

Without star

9 Balloan, Balnamoon, Brodie Castle, Cantray, Castle Fraser, Foulis Castle, Greenbank House, Lamancha House, Skibo Castle.

Unknown

1 Cromarty†.

Dated lecterns

1623	Dundas Castle
1644	Inveresk Lodge
1650?	Neidpath Castle
1663	Ruchlaw
1673	Ladyland
1684	Lauriston Castle
1741?	Foulis Castle
1781?	Cantray
1857?	Fordell

Not dated

16+4†*	Ardgowan*, Balloan, Balnamoon, Brodick, Brodie Castle, Cromarty†, Castle Fraser, Culzean, Dunvegan Castle, Garscube*, Gray House*, Greenbank, Hensol, Lamancha, Loudoun Castle (2), New Liston, Saughtonhall, Skibo Castle, Wemyss, Woodhouselee.
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Bonar equatorials: moon-dials and tide-predictors

1623, 11 Dec	Kenmure Castle/Dumfries Museum.
1630, Dec	Bangor Heritage Centre.
1632, 22 Sept	Whithorn/Kinneff/Royal Museum of Scotland.
1634, 22 Feb	Loudoun Castle/last seen in Brussels by M R Rohr, c 1977.
1636	(Broun), Kirkcudbright Museum.

III Facet-heads, by date and type

Abbreviations used in the main listing:

Cube	Plain cube
Ch	Cube with hollows
Poly	Polygonal
MC	Market Cross.

1563?	Fingask Castle	Poly
1633	Holyroodhouse	Poly
1635	Newbattle Abbey	Poly
1638	Temple*	Cube
1642	Melrose	MC
1645	Kirkforthar	Cube
1651	Inverkeithing	MC
1660	Inch House*	Cube
1664	St Mary's College	Cube
1670	Fettercairn	MC
1674	Kirkdale	Cube
1676	Troquhain	Cube
1677	Callendar House*	Cube
1679	Kelvingrove Museum	Poly
1679	Lennoxlove	Poly
1685	Birkinshaw	Poly
1686	Kirkside Place (2)	Cube
1688	Quinish House	Poly
1688	Sorn Castle	Cube
1690	Airth Castle*	Cube
1690	Bargaly House	Cube
1690	Kinnaird House*	Cube
1691	Bemersyde	Poly
1691	Stroud/Inveresk	Poly

1692	Ardblair	Poly
1695	Galashiels	MC
1697	Airth	Cube
1697	Melville House	Poly
1698	Dunino†	
1698	Keir House	Ch
1699	Howkerse	Cube
1699	Peebles	MC
1701	Ericstane*	Poly
1703	Cumnock	MC
1704	Greyfriars	Cube
1707	Duthie Park	Poly
1708	Bowland	Ch
1708	Chambers Institute†	Cube
1708	Leuchars†	Cube
1709	Dollerie	Poly
1710	Forge	Cube
1710	Stonehaven	Cube
1713	Houston	MC
1714	Rhynd†	Cube
1717?	Ellon (2)	Cube
1727	Kirkside Place (1)	Cube
1731	Altamont*	Ch
1732	Cramond House*	Poly
1732	White House Cramond	Cube
1733	Ballochmyle*	Ch
1733	Elgin	MC
1733	Gask House (3)	Poly
1736	Redheugh*	Ch
1738	Dalnaheish	Cube
1738	Wigtown	MC
1739	Brigton	Cube
1743	Bonaly Tower	Diptych
1745	Powis House†	
1746	Cargill Manse	Cube
1751	Williamston	Cube
1753	Drummore House†	Cube
1755	Meiklehill†	Diptych
1756	Langholm (1)	Cube
1758	Rutherglen Museum	Cube
1760	Arthurstone House	Cube
1764	Balmungo House†	Cube
1764	Monk Castle*	Cube
1764	Torrance House†	
1766	Annan†	Cube
1766	Ardgowan	Cube
1767	Forteviot Manse†	Cube
1769	Swinton	MC
1777	Dumfries	Cube
1785	Ardrossan	Poly
1786	Comely Park House†	Cube
1790	Langholm (2)	Cube
1798?	Johnston Hall*	Poly
1800	Tynninghame	Poly
1810	Newhall	Poly
1815	Coldingham	MC

1840	Bredisholm*	Poly
1889	King's Park	Poly
1891	Linburn (1)	Poly
1900?	Brechin	Poly
1906	Keir House (2)	Cube
1955?	Daldowie	Poly

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