

THE ART OF DIALLING

Hello, and welcome to the Art of Dialling, a podcast from the Royal Collection Trust. Sally Goodsir, Assistant Curator of Decorative Arts, gives a lecture at the Queen's Gallery, Buckingham Palace on the fascinating history of sundials and dialling, and will look at the development of increasingly complex sundials, using examples from the Royal Collection. We hope you enjoy this podcast and for more information about our events, visit the What's On page on our website.

The research for this exhibition included the two Tompion dials in the exhibition just a couple of rooms away and that really sparked my interest in learning more about the dials, the rest of the dials in the Royal Collection, which is what I'm hoping to introduce to you this lunchtime. Seeing them painted on to buildings or understanding how they work in a very simplistic way in a garden was the sort of level I went into this specialism with before the research, but really now learning more about their horological and their astronomical calculations that some of them can perform has really sparked a deeper interest for me. So, I'm going to start with an introduction to four main types of dials, most of which – bar one – are represented in the Royal Collection. So the first two are the two that we're probably most familiar with. On the left a horizontal dial. That's usually the type we would think of in a garden or a park, here one of the Tompions at Hampton Court. They're usually made of metal, often brass or bronze, and they must be positioned so that the dial, noon on the dial faces north, the gnomon – which is a word I'll probably use quite a lot – which is this pointer, the gnomon must point towards the Pole Star and if they are accurately installed they can tell the time to within a minute. The time is told by the gnomon's shadow hitting a point on the dial, as I'm sure we're all very familiar with, and the two sundials next door are both horizontal dials. One is engraved with a conversion table called the equation of time, which I'll go into later, but that enables us to convert from solar time to meantime, which is the time by which we all run our lives. The horizontal dials often feature the maker's name, often a date as well, and as can be seen from the two Tompions, they can survive outside for a few hundred years.

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The vertical sundial, this one is from St George's Chapel at Windsor Castle. They're often seen on churches, often above a porch, but often at least on the south side of the church, because that's the sunniest aspect. And historically they would have been used to regulate the church clock at a time when the church clock would have been the most important clock in a settlement, a town or a village, and the church clock would keep going obviously through the night and through dull days, and when it was sunny the sundial could be used to quickly check the accuracy of the church clock. And some examples, they often give the year, as this one, but also often the name of the benefactor, often a vicar or a church warden.

The other two main types of dials are the equatorial dial or armillary sphere, seen on the left here, and the polyhedral or multi-sided dial seen on the right. The equatorial dial shows the time by casting a shadow on one of the rings and extra rings can be added both for decoration, but also sometimes for further calculations. The multi-sided or polyhedral dial, seen on the right here, is a type common in Scotland and sometimes many dials, as on this example, are incorporated into one block of stone. So each of the little scoops you can see on each of the sides is a sundial. This particular example has lost a lot of its metal gnomons, they've been lost over time. They were particularly popular in the 17th to 19th centuries, often in large country houses in the gardens, and also in Scotland, particularly in market places, centres of towns, so again, very much the time regulator for a local area. And one polyhedral, not this particular one, survives today at the Palace of Holyroodhouse in Edinburgh, but there are also two polyhedrals in the gardens of London royal palaces which have not survived, and I will talk about them later.

So the earliest time measurements using the sun involved the use of tall obelisks to cast shadows, or hollowed boulders, such as the polyhedral, with simple gnomons and hours scratched into the stone. Fascinatingly, the measurement of time by using the sun seems to have developed simultaneously in ancient Mediterranean cultures, so Rome, Greece and Egypt, and in ancient Chinese cultures. So we're not sure at the moment of the connection between the two, if they knew that they were developing the same ideas. And measuring time by the sun is mentioned in the Bible, in the Koran and in Jewish texts. Ancient Greece developed the instrument further and realised the relevance of the latitude to the time on a sundial. And the oldest known sundial in ancient Rome was created in the first century AD and called the Horologium of Augustus after the Emperor. This huge sundial used an ancient Egyptian obelisk measuring 30 metres high as its gnomon, which is this here, and the dial was a huge paved area around the obelisk. Pliny the Elder wrote about this dial when it was about 50 years old and by which point the mathematics had not been quite correct and the

instrument was no longer telling anybody anything helpful. From the parts of the dial which have been excavated several metres under Rome – there's parts of this pavement known under modern buildings – the gnomon seems to have told the time of midday and also, in Roman fashion, this altar here was an altar dedicated to the Emperor Augustus and the sun at noon on his birthday shone right across the altar. So very much honouring the Emperor as well as telling the time. The obelisk gnomon was re-erected in a Roman piazza today, although it's no longer a measurement of time.

And in England the earliest surviving sundials are Anglo-Saxon. These two examples from the north of England, but there's a cluster of dials as well in Hampshire. They're from the 7th centuries AD and they include the Bewcastle Cross in Cumbria, on the left, and the Bewcastle Cross is contemporary with the Archbishop Theodore's mission to Rome, so it's believed that he heard about ancient Roman scholarship or even saw perhaps some surviving ancient Roman sundials and brought the idea back to England. The sundial at Escomb, at the church in Escomb, this is the sundial and it's behind the porch, it's on the main wall of the church, features a serpent across the top, so very much an animal really used in Anglo-Saxon art when you think of the jewels with the serpents very intertwined. And this is the sundial here, the gnomon would have come out of this mark here, which is now broken off. And you can just about see that there's four scratched lines. So the sundial didn't tell hours, it told the four tides of day, which were the four church services at the time and by which the Anglo-Saxons would have run their daily life.

It's not entirely clear how we moved from quite simple dials telling the tides of day to sundials such as this telling the hours. But it seems likely that contact with the Islamic world, perhaps through the Medieval Crusades, and of course the Islamic religion, a lunar cycle and the solar cycle so important for their times of prayer and their services, meaning that hours had to be kept more regularly than just the simple four tides, must have reinvigorated the science of dialling in Europe. And the first known dial in Europe which measures the time in hours is this dial on Jacobi Church in Utrecht in The Netherlands, and bears the date 1463 and has an interesting recent history. In the 1970s when the church was being restored, it was accidentally removed by the builders and put in a skip and a local museum director realised it had disappeared overnight, rescued it, and it's now back in its original location. So a treatise on sundials was published in 1540 by the Flemish scholar, Gemma Frisius, so again, very central European scholarship being very important to the sundial development. His university at Louvain, today in Belgium, was renowned for its contact with universities in Spain, so perhaps had influences from the Arab and the Moorish world in their new theories. And it's

important to remember that at this point the sundial is still the essential necessary object to tell the times of the day.

In the same time as central Europe was developing some of the early treatises on sundials, England began to produce fine scientific and horological instruments, and one of the early makers in England was Nicolaus Kratzer, who'd come here from Bavaria in 1520 and Henry VIII appointed Kratzer his horologer. He tutored Sir Thomas More's children in mathematics and he tutored Cardinal Wolsey and the students at New College, Oxford. And for Cardinal Wolsey, Kratzer made this portable – it's about this high – this portable polyhedral dial. And it features, just here, the Cardinal's wide-brimmed hat and his coat of arms. And the artist, Hans Holbein, also became a friend of Kratzer and painted this portrait of him with his dial in his hand. So more publications about dialling from Italian astronomers included instructions for the manufacturer and laying out of dials and made them slightly more accessible to the amateur, interested mathematician. And it's at this point that sundials begin to appear in the garden. Renaissance men of course combining so many interests in believing that the garden was a good place for horology now, as well as botany, astronomy, geography, navigation, and a lot of books that included the art of dialling also included other specialisms.

In 1619 Sir Nicholas Stone designed a polyhedral dial for the gardens at St James's Palace, for which he was paid £6.13s.4d and shortly after a visitor from France saw the sundial and described it as having 117 dials upon it, so a huge polyhedral creation. And three years later, a similar dial was erected in the privy garden at Whitehall Palace. Neither survive into modern times. And unfortunately, the Whitehall polyhedral was damaged by a drunk courtier 50 years after its installation – it was reported in the papers – and it seems to have never been properly conserved, it disappears from sight at that point. King Charles I was interested in sundials and he reputedly carried a silver portable dial with him at all times, which he presented to his second son James on the evening before his execution. And at Charles I's court, the Serjeant Painter, Johann de Fritz, listed a bill for painting a sundial in colours. After the King's execution his art collection and his possessions were sold by the Commonwealth and at Oatlands [?] Palace one of the lots was two stone sundials with a wooden seat, sold for £2.0s.6d to a Mr Lavender. But the sundial offered from Greenwich Palace must have been a particularly valuable one, it was offered at £30 and didn't find a buyer. So these great stone dials were probably like those that survive today at Iron Acton Court in Bristol and Madeley Court in Shropshire. One of the other major tracts which made dialling slightly more accessible to a sort of amateur mathematician was John Seller's, *A Pocketbook*, and as you can

see, it really combines a lot of specialisms that we would consider quite separate today, but combined into one book.

After the restoration of the monarchy, Charles II restored the gardens at Whitehall Palace. In 1699 a marvellous pyramidal dial was erected, near the Banqueting House, which today is the only surviving part of the Palace. And it consisted of six hollow – oh sorry, there's more – eight hollow globes here out on the brackets, one above the other, which apparently all told the time. There were portraits, which you can just see here, and they were portraits painted on glass of Charles II, his Queen, Catherine of Braganza, the Duke of York, Prince Rupert and his mother, Henrietta Maria. The time could be told somewhere up here using, I think they mean that these are gnomons, but from the description and the image I'm not entirely sure how to work it out. But the whole instrument was so complicated that there were several pamphlets published on how to read it. Just a few years later the dial was recorded as weather damaged, which perhaps isn't surprising if there were sort of glass plates on it. But parts of it apparently survived into the 18th century when it was last known here at Buckingham Palace, and the art historian George Virtue, notes about it being sold, which is quite surprising because George III, then the King, was very interested in science and horology, so seems quite an interesting history and something I might look into a little more.

So 17th century Scotland saw a high point in the art of dialling with these huge polyhedral dials, using local stone and very intricate carving. The example at Glamis Castle, the childhood home of Queen Elizabeth, the Queen Mother, has 84 different faces and it's 21 feet, three inches high. The photograph beside gives some sense of the scale. You can tell the children are standing on this level here and obviously their heads only come up to about here. You can see these are the lowest dials – this is a dial, this is a dial – held by heraldic beasts. And the young girl front right is the future Queen. Part of the charm of these polyhedral dials is their sheer exuberance in the carver's skill, but they also reflected the serious scientific bent of the owner, and there's also several academics have tried to trace networks of freemasonry between the patrons of these huge polyhedrals and where they were placed and which market towns had them. It's a really interesting network. But it's not entirely clear why this phenomenon was peculiarly Scottish, of course stone is also particularly the building fabric of a lot of the big country houses, so it might have been a familiarity with using large pieces of stone as well. But another great polyhedral is this, standing in the gardens at the Palace of Holyroodhouse, and Charles I presented this polyhedral to his Queen, Henrietta Maria, for the gardens at Holyrood in 1639, which was when Charles I had his Scottish coronation, which is the last Scottish coronation to take place, in the Abbey at Holyrood which is now a

ruin beside the Palace. And the dials' facets, so each of the faces, there's heart shapes, there's some there, there's cup shapes. This one's particularly great; he's lost his gnomon which originally came out of his nose, but I think he's probably the sun, it's a face with kind of flaming shapes coming behind him. And the underneath here where obviously the sun can't quite reach, there's the arms of Scotland, thistles, roses and the initials of Charles I. And the King's architectural office, the Office of Works, noted a payment of '£408.15s.6d to John Milne, mason, for the working and hewing of the dial in the north yard'. So there's an absolute record of exactly when this was worked. And £66.14s.4d to John Barton for 'gilding, making and graving the dial'. So obviously originally the gnomons – there's one just there – were gilded and he obviously engraved all the little hour scratches, which you probably can't quite see in the photo, into each of the shapes. And Mylne was the King's master mason, his descendants would work at Holyroodhouse for several more generations. The overall cost of the dial works out at over £35,000 today and hints at the great importance of this sundial to the garden and of course to the King and Queen and shows what an enormous expenditure a lot of the other very large Scottish polyhedrals must have been. And until last week, the current base has been thought to be a Victorian creation not particularly related to the top part, but this print, dated 1835, shows the sundial in its original position a little distance away from where it is now, and the base is the same. So the current base is either a total recreation, a faithful recreation of the original, or the current base is actually still the original and all that happened was that the whole sundial moved in the 19th century. But again, something to look into.

So we move now to Windsor Castle and this sundial might be familiar to visitors as it stands on the North Terrace which is occasionally open at certain times of the year. Its gnomon features the scrolling cipher of Charles II, so there's a 'C' and there's two 'R's which face backwards against each other. The dial bears the date 1678 and the maker, Henry Wynne, and the pedestal was carved by Grinling Gibbons. It's presumably – again there's an Office of Works bill for this dial; 'a large brass horizontal dial costing £40' and mentioned in a bill the same year as the dial was created. And originally there was a second Henry Wynne dial known to stand on the terraces at Windsor and it seems likely that this partner dial is now the dial in the gardens at Clarence House. The second dial at Windsor disappears from Windsor in the 1820s and simultaneously a Henry Wynne partner appears at Clarence House. So George IV, who was reworking the gardens at Windsor and quite a lot of garden statuary moved at this moment, it seems that it's very likely he sent this sundial to Clarence House, which then was the home of his brother, the Duke of Clarence, later William IV.

So two dials, which I hope you're familiar with from the exhibition, or you soon will be, horizontal dials were sometimes supplied with a clock at the same moment, as a package. For example, when Thomas Tompion presented a longcase to the city of Bath in 1709 a horizontal dial went with it. And the dial would be used to regulate the clock whenever it was sunny. The pair of Tompion dials in the exhibition here were supplied to William III and placed in his privy garden at Hampton Court Palace and from a letter I found when researching the dials, it seems they were probably installed in the autumn of 1699. During the summer of 1699 Mr Bryan, the King's housekeeper, was preparing the new Christopher Wren Rooms for the King to stay and the King first stayed in October after a day's hunting in Bushy Park, now Bushy Park. In November a customer of Thomas Tompion's went to his shop in the City trying to get his Tompion watch fixed, but wrote to his friend that he couldn't see him because 'Mr Tompion and Mr Nost being gone to Hampton Court, it was not possible'. And Mr Nost was John Van Nost who carved the pedestals and other pieces of garden statuary in the garden. So this seems really specifically to locate the installation of the dials. And originally these two sundials were companions to two other Tompion dials in the same garden, so there would have been four. The other two left the Royal Collection in the early 19th century when George IV was reworking several gardens and moving garden statuary. One of them came up for auction in London in the 1990s with a slightly later replacement dial and the figure supporting the dial is a blackamoor and the other figure on the other sundial was an Indian. Both figures, quite extraordinary to us today, but they were very familiar to the court as being common figures in court plays, court masques, so they would have resonated with the court audience and very much brought the garden inside and outside, would have really combined those two worlds.

So William III commissioned several clocks from Tompion for both his own use and for diplomatic gifts. Sundials would have been required to regulate the clocks, but it's not possible to confirm which of his clocks was directly related to the supply of the sundials. However, the sundials would have been really important to Hampton Court, keeping regular timekeeping across quite a complex and large Palace site with many clocks. And this particular Tompion is the one which is engraved with the equation of time, and it has the following instruction: 'Set the watch so much faster or slower than the time by the sun, according to the table for the day of the month when you set it. If the watch go true, the different of it from the sun and day afterwards will be the same with table'. Which maybe doesn't explain it terribly well. So to a sundial enthusiast, the sun time on a dial, so the shadow cast, is called apparent solar time, and the clock time which you read off your watch today and off your longcases historically, is local mean time. So the dial is always accurate but

those mechanical clocks were usually only accurate at the moment they were set and could quicken and slow according to their individual bent. So the difference between solar time and the mean time varies every day of the year in an annual cycle, and this difference is called the equation of time. So this table would tell you how much to convert your sundial by a few minutes a day into the real time you wanted your clock to work at. There is today the added flaw that for just over a century we've been subject to British Summer Time here to adjust our summer daylight hours, which then throws British sundials in the summer out by another hour. So the Hampton Court Tompions are really excitingly depicted as tiny spikes in this Knyff painting just here. The Knyff painting about two years after we think they were installed. And they stood together there on that terrace until 1832 when one of them was briefly sent to Kew Palace, and it returned to Hampton Court in the early 20th century. Both the dials outside today are facsimiles and the actual Tompions that you'll see in the exhibition are the originals.

So sundials began their slow demise in Britain with the invention of the railways, which needed national and today even international time to be regulated. But they remained a decorative and prominent feature in many gardens and on the walls of country houses. And into the 19th and 20th centuries they became appreciated as art objects as well as scientific instruments, with the inclusion of rhyming couplets and philosophical phrases on the passing of time. This late 19th century vertical dial on the wall at Sandringham House in Norfolk features a popular sundial motto by Alfred, Lord Tennyson: 'Let others tell of storms and showers, I'll only count your sunny hours' and the motto was selected by Queen Alexandra. And just as a piece of fun, Fry's chocolate released a set of trade cards of sundials, one of which was the Sandringham sundial, not an item in the Royal Collection I'm afraid, but quite fun anyway. And an early 20th century addition was also this heliochronometer by Pilkington and Gibbs. A heliochronometer working in a slightly different way; you have to adjust a few pieces on it and then it will tell you the time. This one, the column dedicates it to Edward VII in 1908 and it stands in the gardens of Windsor Home Park and in the location that was used for royal picnics and sort of day trips for the royal family at the time. Around the, just where the heliochronometer fix is, it bears the phrase, 'Time wings away as flowers decay'.

And a little further into the 20th century, this photograph from the early 1930s shows the young Princess Elizabeth and Princess Margaret with their simple 20th century sundial outside their model Welsh cottage. And it's really lovely; it's placed on a height on a pedestal that a child can read it. And another stylised 20th century dial is this 1980 example, presented to Queen Elizabeth, the Queen Mother, as an 80th birthday gift. And the plinth was made by the

sculptor Brian Asquith, who was perhaps better known for large, modern ecclesiastical installations; very large candlesticks and pieces like that. The dial was engraved by George Lukes, he was a silversmith, and the sundial design assisted by Christopher Daniel, a great sundial specialist. And so it's really lovely to see it combines modern craftsmanship and the mathematical accuracy of a sundial. And the interest in dials has enjoyed something of a renaissance in the late 20th century. So other modern sundials in the Royal Collection include these two which were wedding gifts to Princess Elizabeth and Prince Philip in 1947. The one on the left from the people of Caithness is carved in Caithness stone, so lovely that it's continuing that Scottish tradition of sundial working in stone. And the one on the right was from the parishioners of Corsham Regis and it bears the motto: 'In this garden fair, amidst your flowers, serene I stand and show your sunny hours', which is quite similar to the Sandringham motto. And both dials are in use today in royal gardens. Sundials have been used as gifts later in the reign with this Welsh slate example, presented in 1995 when the Queen visited St David's upon it becoming a city. And again, that's in use in a garden. The final sundial brings us almost to the current day with a very unusual object. It's a permanent installation at Roadford Lake Country Park, which is on the Devon-Cornwall border, and it was an official gift to the Queen for the Golden Jubilee in 2012, but is permanently located in a non-royal location, so quite an unusual object. And the gnomon, this shape, is six pieces of silvered steel, one for each decade of the Queen's reign, and the hours are marked by these granite standing stones. It's again, it's a very unusual object and officially received by the Earl of Wessex in 2012 on a really not sunny day. [laughter] So unfortunately he wasn't able to see it working, but a better photograph here, I think, just. But thank you very much for listening and I hope that's really highlighted some of the more unusual sundials in the Royal Collection.

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